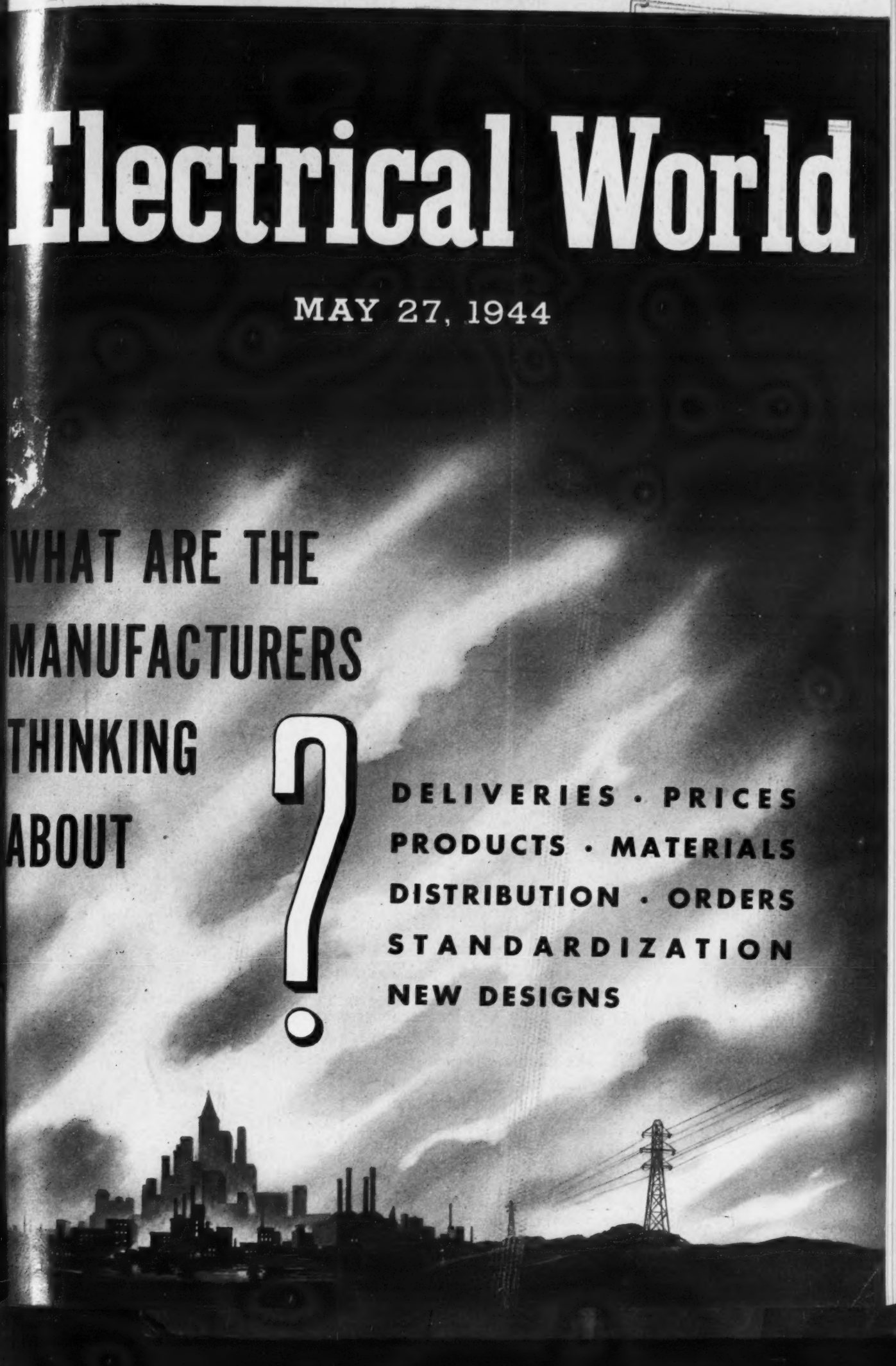
Electrical World

MAY 27, 1944



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TO MEET MOST PRODUCTION SCHEDULES!

Authentic WESTONS

At WESTON, production finally has outstripped the overwhelming war demand for panel and other instruments . . . making WESTONS again obtainable on a basis to meet most war production schedules.

To experienced instrument users, this means they again can obtain the instruments whose design and manufacture incorporate the broadest instrument experience in surmounting the requirements of exacting applications. The instruments whose consistent, uniform performance simplifies their problems of inspection, handling and other burdensome procedure . . . and whose dependable, long-term accuracy assures better operating performance from the devices into which they're built.

Why not discuss your instrument schedules with WESTON, today . . . and be sure of obtaining the added product efficiency which authentic WESTONS provide.

- *Panel & Switchboard Instruments (DC, AC, and Thermo)*
- *Precision DC and AC Portables*
- *Instrument Transformers*
- *Specialized Test equipment*
- *Laboratory Standards*
- *Sensitive Relays*
- *Light Measurement Instruments*
- *Aircraft Instruments*
- *Electric Tachometers*
- *Dial Thermometers*

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618 Frelinghuysen Avenue, Newark 5, New Jersey

FOR OVER 55 YEARS LEADERS IN ELECTRICAL MEASURING INSTRUMENTS

Electrical World

FOUNDED IN 1874 • READ BY ELECTRICAL MEN FOR 69 YEARS

May 27, 1944

Vol. 121, No. 22

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From .....

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To .....

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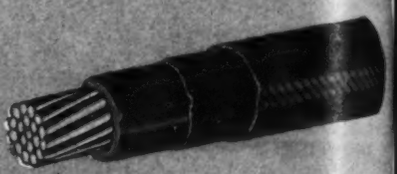
Signed .....

1844 - One Hundred Years of Telegraphy - 1944

from the needs of telegraphy Okonite wire and cable research was born



JOHN HAVEN CHEEVER, pioneer rubber manufacturer, was started on the great research job that ended in his founding The Okonite Company when his friend Samuel F. B. Morse suggested the need for a rubber insulation that would protect telegraph wires in damp places.

Cheever succeeded and Okonite's first major work was in supplying covered telegraph wire that helped our fast expanding nation get its messages through, despite trying conditions of heat and moisture.

So it has been for 66 years. As insulated wires and cables were needed for new developments, Okonite research supplied them; frequently our investigations have indicated far reaching possibilities in cable insulations and cable construction which have found valuable applications. In a number of instances we have developed new synthetic compounds which time has proved are superior in many respects to those made from natural materials.

Okonite research is not an abstract, theoretical venture. It's a down to earth, practical branch of our business. Its results are of benefit to — and available to — all our customers. It's both general, in a broad sense, and very specific in its search for perfection and discovery in individual fields.

REPORT
ON
OKONITE CABLE
LORD KELVIN, F.R.S.
DR. JOHN HOPKINSON, F.R.S.
DR. J. A. FLEMING, F.R.S.

A report, made over 50 years ago, on Okonite Cables by English scientists who found Okonite Insulation "excellent".

For a discussion of Okonite wire and cable research, with concrete examples, write for Bulletin OK-1005A, a well illustrated 36 page booklet.

The Okonite Company, Passaic, New Jersey.

OKONITE

Insulated Wires and Cables

THE DERIVATION OF OKONITE

OK — *A signal flashed by telegraphers indicating message got through.*

O — *To aid in pronunciation.*

NITE — *A suffix used in the early days (as in "vulcanite") to signify "insulation".*

3668

Furnished in 3 types for: Guy Strain Insulators, Spool Insulators, Disc Insulators

Electroline Automatic Dead End Feed-Through Type 3300 Series Easy to take up slack. Jumper installation made easy — permits tapping back of dead end

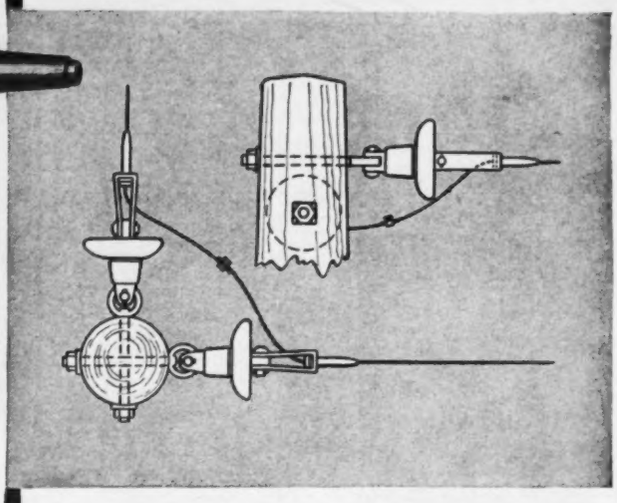
Electroline Automatic Dead End to fit Spool Type Insulators . . . .

Electroline Automatic Dead End to fit Guy Strain Insulators . . .

Electroline Automatic Dead End to fit Disc Type Insulators . . . . . .

"THEY'VE GOT MY OK"

A CONSTRUCTION LINEMAN will tell you more about the value of Electroline Automatic Dead Ends in fewer words than the engineers who designed them. The lineman knows, from practical experience, how quickly and easily and confidently he can install Electroline Automatic Dead Ends and guarantee a good job.



He appreciates these features; Full automatic gripping—no tools nor extra equipment required; Full strength of conductor maintained, without slippage; Full reclaimability for further use. **This Automatic Dead End dampens vibrations and guarantees full life of conductor.**

Utilities have chosen Electroline Automatic Dead Ends to cut construction costs, save time and insure stronger lines.

You may well profit by the same advantages. Get the complete details on up-to-date methods and equipment used in dead-ending. Write for Bulletin.

Prices on Request.

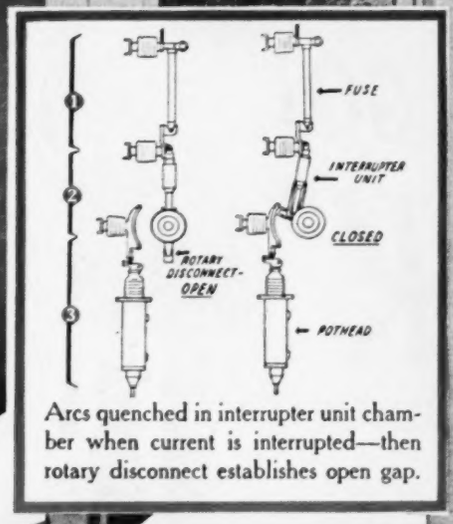
Electroline Company

Originators and Patentees of Automatic Line Splices and Dead Ends

4121 SOUTH LA SALLE STREET • CHICAGO, ILLINOIS

CHECK the FACTS

RATINGS
2,300 to 15,000
200 and 400 Am



Arcs quenched in interrupter unit chamber when current is interrupted—then rotary disconnect establishes open gap.

GROUP A - with current limiting or non-expulsion power fuses

For full details on designs and applications — Consult the new R&IE BULLETIN No. 1302

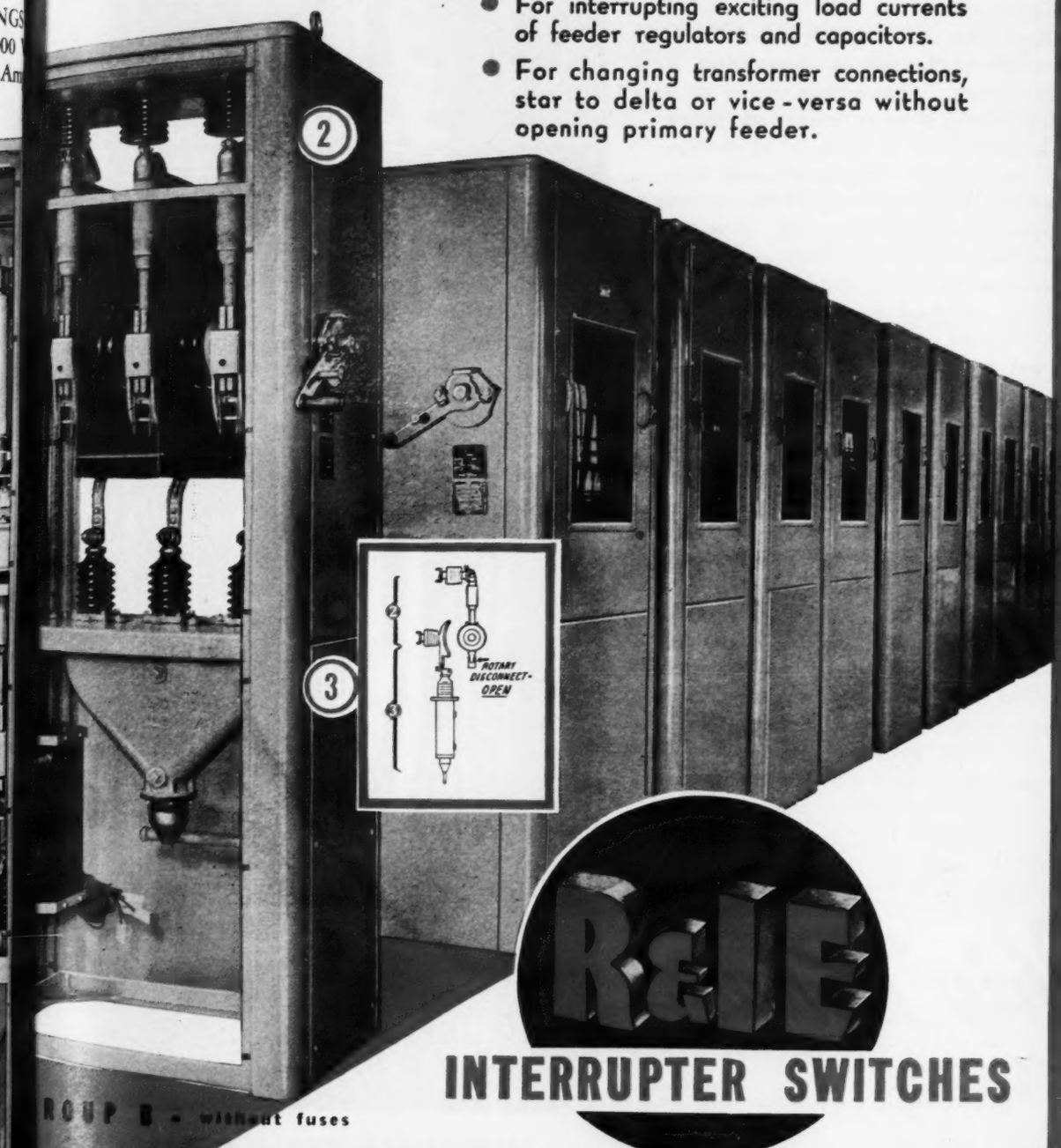
E INTERRUPTER SWITCHES
STRIBUTION CIRCUIT APPLICATION

ONSTRUCTION

- odern, streamlined all-welded steel ousings.
- ompact arrangement with easily movable panels.
- rge windows for safe visual indication.
- ll porcelain insulation.
- oor, wall, rack or transformer mounting.
- ailable with conduit, through busing, ud or pothead connections.

APPLICATION

- In combination with fuses, to provide an economical means of fault protection and isolation for maintenance.
- To isolate transformer banks, instead of oil switches or expensive circuit breakers.
- For transfer or removal of load on energized distribution circuits.
- As a sectionalizing switch in feeder circuits.
- As an ordinary disconnect to provide safety in case of operating error.
- For interrupting exciting load currents of feeder regulators and capacitors.
- For changing transformer connections, star to delta or vice-versa without opening primary feeder.



R&IE

INTERRUPTER SWITCHES

ROUP B - without fuses

WAY AND INDUSTRIAL ENGINEERING CO. GREENSBURG, PA. - In Canada, EASTERN POWER DEVICES, Ltd., Toronto

The Check List

CONDUCTOR SUPPORTS, CLAMPS AND FITTINGS

DISCONNECTING SWITCHES INDOOR AND OUTDOOR

AIR BREAK SWITCHES

✔ INTERRUPTER SWITCHES

CUTOUTS AND THERMO-RUPTERS

SWITCH OPERATING MECHANISMS

SUBSTATIONS

OPEN OR ENCLOSED, ISOLATED PHASE HEAVY DUTY BUSES

KIRK INTERLOCK SYSTEMS

AUTOMATIC SECTIONALIZING EQUIPMENT

METAL CUBICLES

TESTING DEVICE

O-B BUSHINGS

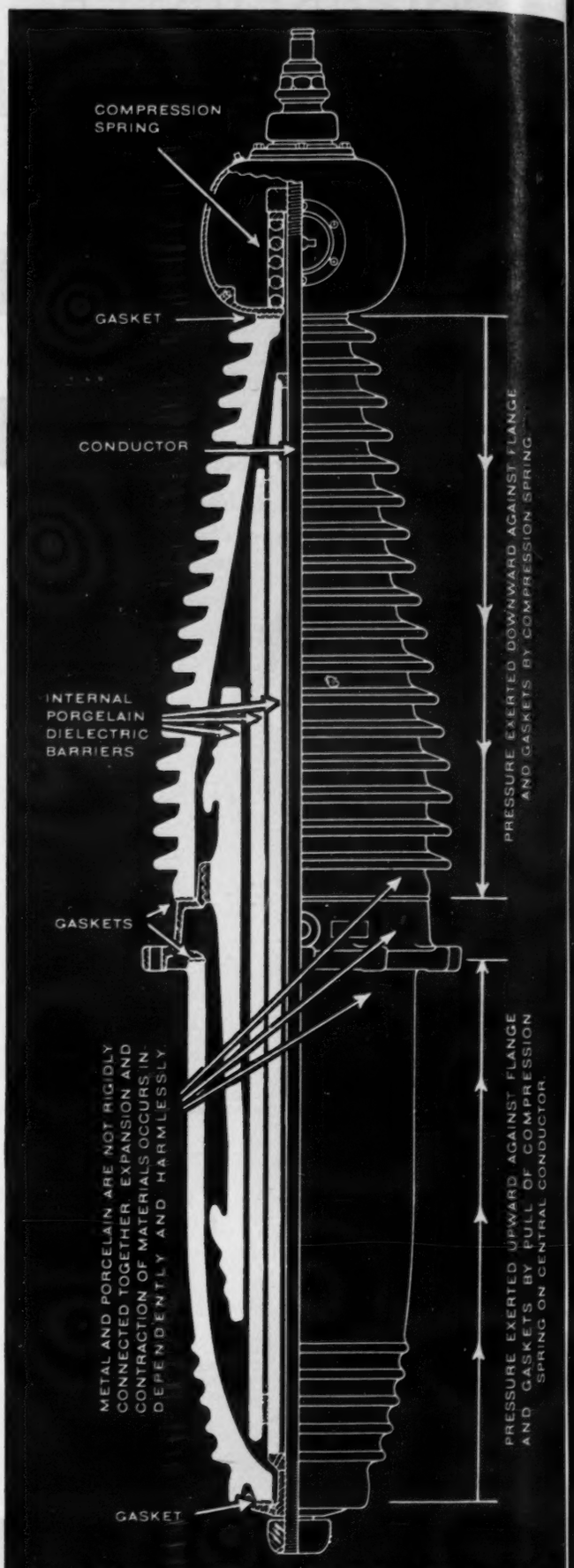
are sound

MECHANICALLY

as well as

ELECTRICALLY

ONE necessity of good breaker performance is a bushing, accurate in its alignment to start with, and capable of maintaining that alignment indefinitely throughout the life and operation of the apparatus. Inherent stresses in a bushing at the time of manufacture, or that develop later as a result of service, defeat permanent alignment and also threaten the bushing's life. These stresses can come from rigid assembly of porcelain and metal parts; or they may occur in cycles as heat and cold affect heavy members attached to the bushing terminals, where no mechanical relief is provided in the bushing's design...O-B bushings are held together entirely by the endways pressure of a massive spring. No rigid joints exist between porcelain and metal. Expansion forces due to heat and cold, and other mechanical stresses are absorbed harmlessly. Gaskets are worked continuously at their correct loading, thus avoiding leakage...While a bushing is a highly specialized electrical insulator and involves precise, ingenious electrical design, all this can be defeated if it does not possess great mechanical integrity as well...Good performance is assured by O-B's principle of compression spring assembly, and service records that are setting entirely new standards back up this assurance...For bushings that are sound *mechanically as well as electrically,* specify O-B.


COMPRESSION SPRING
GASKET
CONDUCTOR
INTERNAL PORCELAIN DIELECTRIC BARRIERS
GASKETS
GASKET
METAL AND PORCELAIN ARE NOT RIGIDLY CONNECTED TOGETHER. EXPANSION AND CONTRACTION OF MATERIALS OCCURS IN DEPENDENTLY AND HARMLESSLY
PRESSURE EXERTED DOWNWARD AGAINST FLANGE AND GASKETS BY COMPRESSION SPRING
PRESSURE EXERTED UPWARD AGAINST FLANGE AND GASKETS BY PULL OF COMPRESSION SPRING ON CENTRAL CONDUCTOR.

OIL TIGHT WITH DANGER OF FUTURE DAMAGING STRESSES ON PORCELAIN COMPLETELY ELIMINATED

Ohio Brass

MANSFIELD, OHIO

CANADIAN OHIO BRASS CO., LTD., NIAGARA FALLS, ONT.

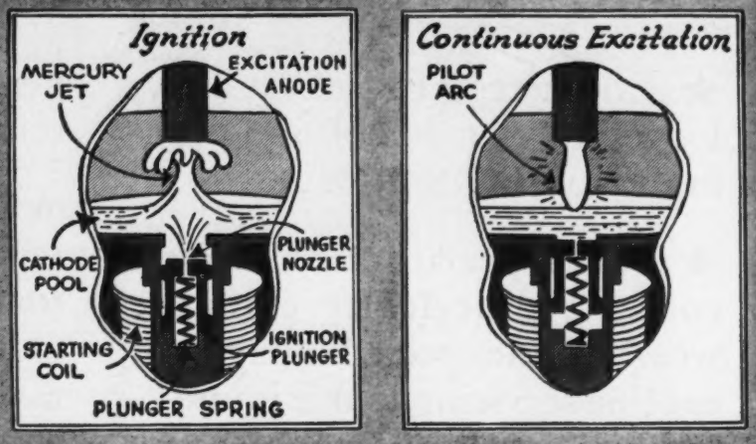
2476-H

GET STABLE D-C

WITH EXCITRON MERCURY ARC RECTIFIERS!

Here's the Excitron Principle . . .

Allis-Chalmers Excitron employs simple, one-time ignition for "continuous excitation". To close circuit, plunger beneath mercury surface shoots jet up to excitation anode . . . which is safe distance above mercury cathode, *cannot be affected by impurities or turbulence on mercury surface.* When jet collapses, pilot arc remains.



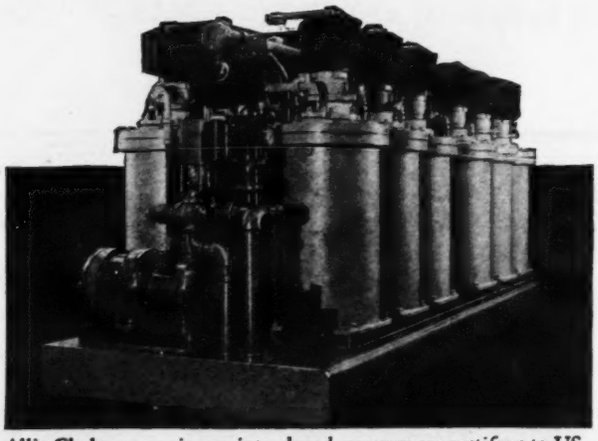
☛ Allis-Chalmers' Excitron is the only single anode mercury arc rectifier which gives you the advantages of "continuous excitation".

☛ There are no ignition impulses to be synchronized with main anode voltage. Tubes don't require re-ignition at the start of each positive half-cycle.

☛ Only Excitron uses direct current from a 3-phase source for excitation of the tube. Thus, stability of excitation cannot be affected by average single-phase dips in a-c system voltage.

☛ Excitron has a simple excitation circuit which requires no "tuning" to maintain proper wave shape. Once adjusted at factory, no further adjustment needed.

☛ Write Allis-Chalmers, Milwaukee 1, Wisconsin, for the Excitron answer to all your power conversion problems. A 1717



Allis-Chalmers engineers *introduced* mercury arc rectifiers to US.

ALLIS-CHALMERS EXCITRON MERCURY ARC RECTIFIERS

How Allis-Chalmers Saves You Money:

★ Contacts are heavy-duty, long-life . . . made of non-burning Elkonite RS-1045.

★ These special Allis-Chalmers contacts practically eliminate wear and unexpected outage, cut routine servicing to minimum... contributing important economies to your power system.

★ Large circuit breakers interrupt current between tap changes . . . give shockless contact movement . . . prolong life of your equipment investment.

★ Motor-operated tank hoist raises and lowers circuit breaker housing on large units . . . cuts inspection time—saves on maintenance.

★ "Feather-Touch" Control with exclusive voltage integrator is available for automatic regulation. It reduces operating cost, assures best overall voltage characteristics.

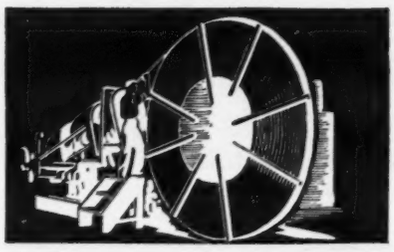
★ Entire unit is precision-machined for top efficiency . . . ruggedly built for the years.

★ Allis-Chalmers pioneering in Load Ratio Control pays off today in better on-the-line performance, greater operating economy. Used on over 8,000,000 kva of U. S. power.

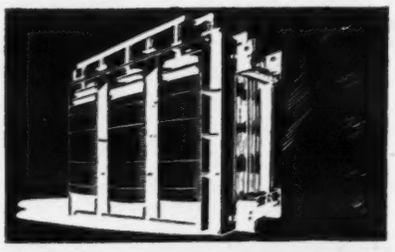
A 19

♪ *Tune in the Boston Symphony, Blue Network, every Saturday at 8:30 pm, EWT.*

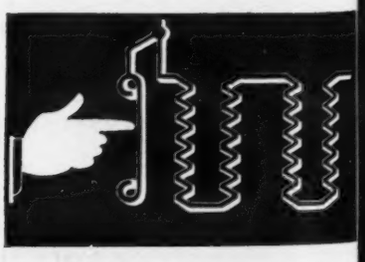
Wise Buy: ALLIS-CHALMERS POWER



CIRCULAR COIL is the ideal design electrically — is strongest mechanically. Wound with uniform tension. Has heavy turn-to-turn insulation, brazed connections.



SHELL TYPE CONSTRUCTION permits solid insulation between coils without impeding oil circulation. Results: increased cooling, longer life, lower maintenance.



ELECTROSTATIC PLATE absorbs shock of high impulse voltage, distributes stress evenly . . . thus safeguards transformer life, reduces possibility of unexpected breakdown.

Load Ratio Control

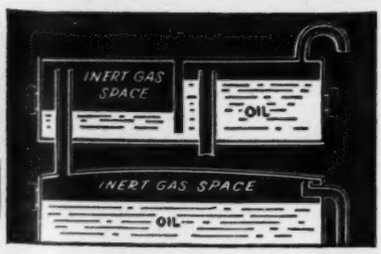
VOLTAGE CONTROL on large, high-power systems contributes to greater operating economy by regulating output in accordance with consumer demand.

With Allis-Chalmers Load Ratio Control you get advanced, time-proven equipment — from a pioneer in the field of voltage regulation.

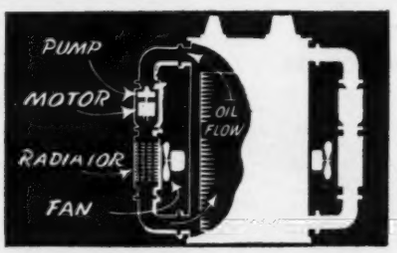
Get the complete story on these units from our nearby district office — or write direct to ALLIS-CHALMERS, MILWAUKEE 1, WISCONSIN.

WE WORK FOR VICTORY WE PLAN FOR PEACE

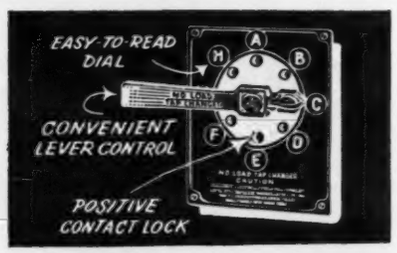
TRANSFORMERS *with Load Ratio Control*



OIL-SEALED INERT GAS EQUIPMENT provides low pressure cushion over insulating oil to allow for expansion. It's simple, foolproof ... has no moving parts, no delicate valves.



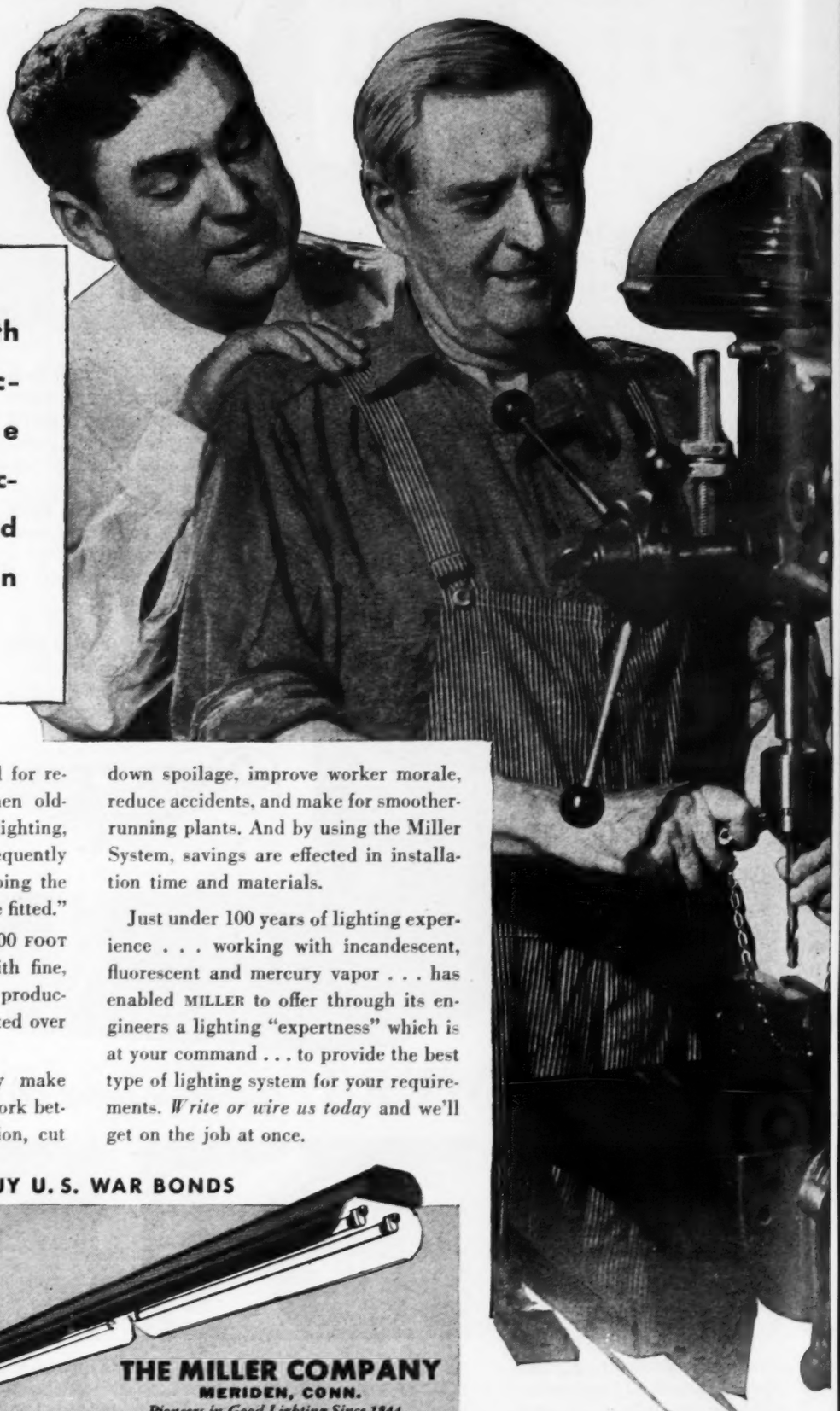
ELECTRO-COOLER for economical, practical forced-oil cooling. Steps up load capacity by accelerating oil-cooling process. A self contained unit requiring minimum maintenance.



NO-LOAD TAP CHANGER operates from side of tank, away from high voltage lines—is convenient and safe. Operating mechanism is simple, sturdy; contacts are heavy-duty.

"Gramp" YAEGER'S BACK ON THE JOB!

...and



Miller is back with 100% steel reflectors—the same rigid steel construction you knew and used and liked in 1941 and 1942.

WPB has lifted the ban on steel for reflectors! And WPB says, "When oldtimers are provided with good lighting, tailored to their needs, it is frequently possible for them to keep on doing the precision work for which they are fitted."

MILLER 50 FOOT CANDLER or 100 FOOT CANDLER will provide plants with fine, man-made *daylight* . . . adequate, productive illumination evenly distributed over every working surface.

Better lighting will actually make workers see better, feel better, work better. It will help speed production, cut down spoilage, improve worker morale, reduce accidents, and make for smoother-running plants. And by using the Miller System, savings are effected in installation time and materials.

Just under 100 years of lighting experience . . . working with incandescent, fluorescent and mercury vapor . . . has enabled MILLER to offer through its engineers a lighting "expertness" which is at your command . . . to provide the best type of lighting system for your requirements. *Write or wire us today* and we'll get on the job at once.

BUY U. S. WAR BONDS

MILLER

50 FOOT CANDLER
100 FOOT CANDLER
Continuous Wireway Fluorescent Lighting Systems

THE MILLER COMPANY
MERIDEN, CONN.
Pioneers in Good Lighting Since 1844
● MILLER offers a complete line of filament and fluorescent lighting equipment

A MILLER Message in line with WPB's helpful handbook, "Plant Efficiency."

Many hands make their good contribution to Chromel heating element wire. These hands have been on the job a long time, many for more than twenty years. Thus, into Chromel nickel-chromium wire goes that "extra something" that is not made up of things mysterious or secret—but is merely the product of mature experience, sincere effort and pride in their work. All this finally shows itself in heating element wire, or "cold" resistance wire, that is consistently good. If you specify heating element, or resistor material, you're doing all right when you specify Chromel. . . . Technical data are given in Catalog-M. Glad to send you a copy.

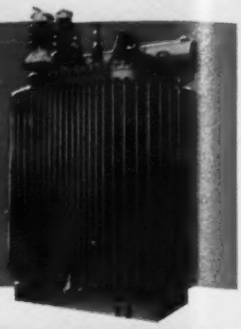
Chromel
NICKEL CHROMIUM
HOSKINS CHROMEL
ELECTRICAL HEATING ELEMENT
WIRE

HOSKINS MANUFACTURING COMPANY, DETROIT 8, MICHIGAN

Good Engineering and make Standard

TRADE MARK

Standard POWER TRANSFORMERS



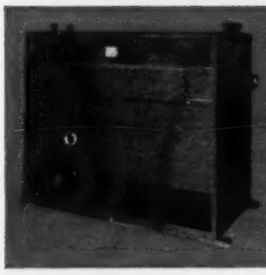
Standard Power Transformers are made in all commercial ratings up to 10,000 KVA, oil or Askarel filled. Coils are thoroughly protected, firmly braced and provided with liberal cooling area. Furnished also as Unit Substations, with switchgear integrally mounted in an enclosed cabinet.

Standard DISTRIBUTION TRANSFORMERS

Standard Distribution Transformers have been thoroughly tested in utility and industrial service. The line includes units from 1.5 to 500 KVA, all commercial voltages and frequencies. A simple, rugged design and careful construction account for the dependable, economical operation of Standard Distribution Transformers.

Standard RURAL TRANSFORMERS

Standard offers Rural transformers of the conventional design, also of the entirely self-protecting type equipped with approved arresters and circuit breakers. Simple, sturdy construction and time-tested designs assure dependable service in remote locations. Regularly made in sizes from 1.5 KVA to 25 KVA.



Standard AIR COOLED TRANSFORMERS

Standard Dry Type Air Cooled Transformers are made for either indoor or outdoor service in ratings from 0.050 to 1000 KVA. Available with either class A or class B insulation. Drip proof and enclosed cabinets can be furnished. Advantages: no fireproof vaults needed; installed near load center; save floor space; permit flexibility in arrangement.

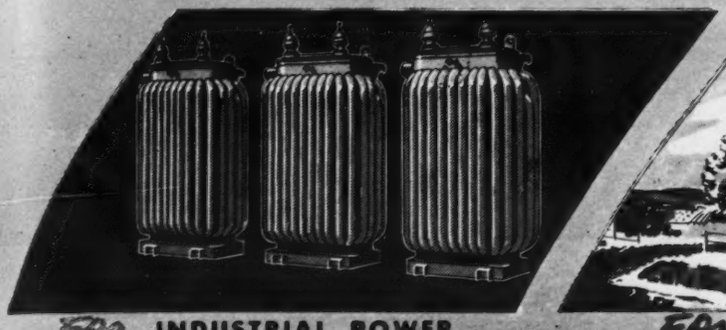
THE STANDARD TRANSFORMER C

Makers of: POWER, DISTRIBUTION, RURAL, INSTRUMENT, STREET LIGHTING

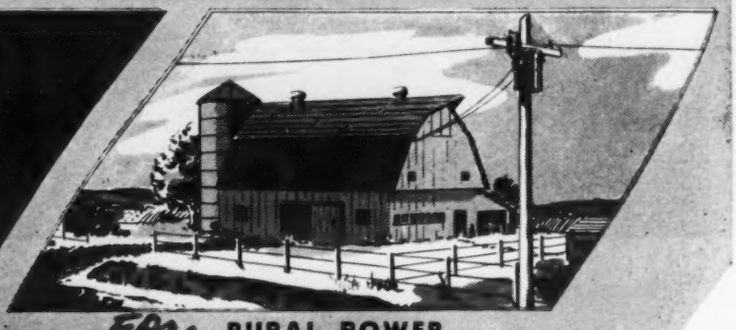
Sound Construction

Transformers

Dependable **Adaptable** **Economical**



For INDUSTRIAL POWER

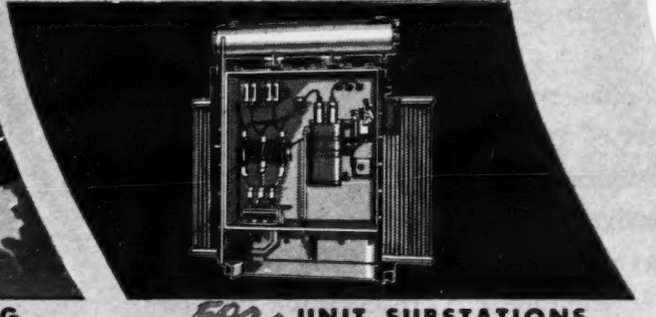


For RURAL POWER

For METERING

For TESTING

For STREET LIGHTING

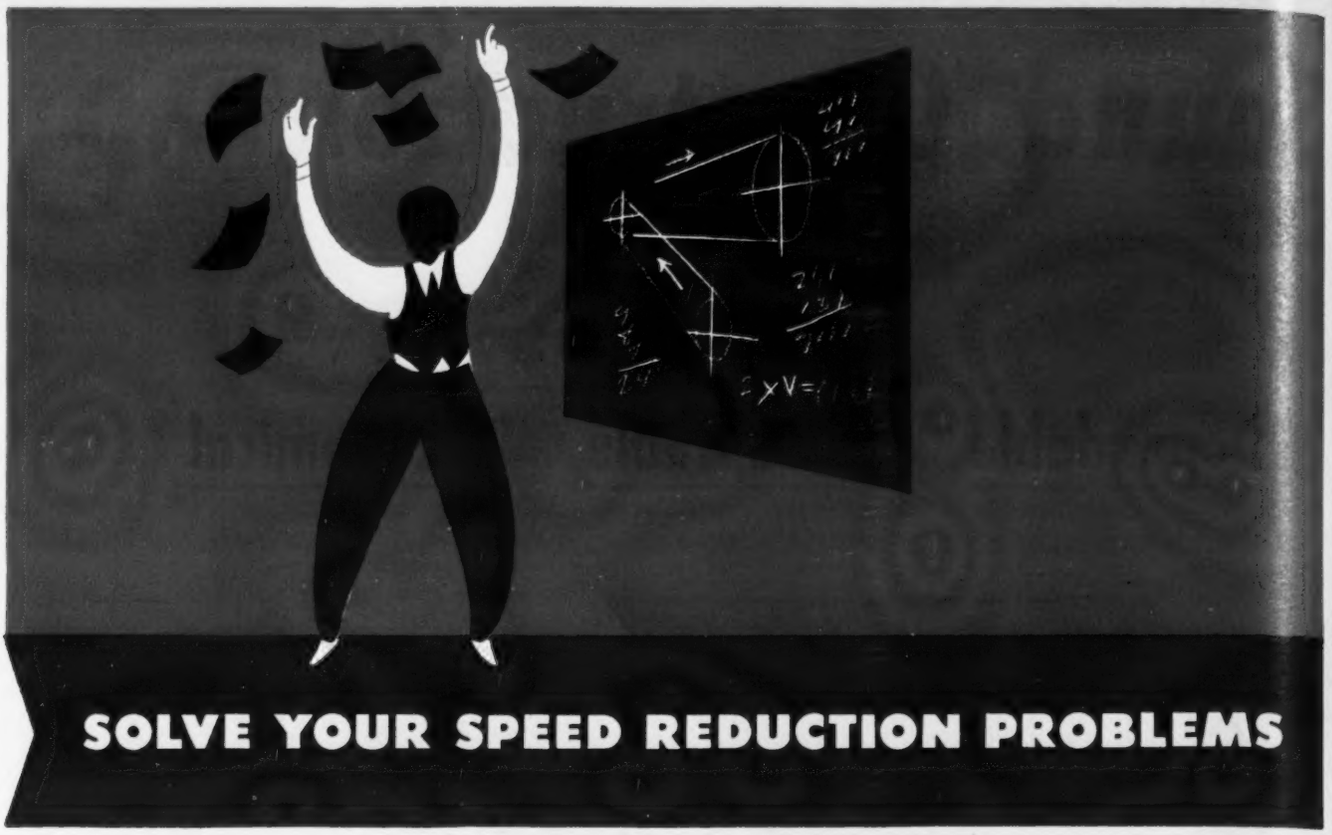


For UNIT SUBSTATIONS

R COMPANY WARREN, OHIO

Transformers . . . . . OIL, ASKAREL OR AIR *Cooled.*

Representatives in 29 Principal Cities



SOLVE YOUR SPEED REDUCTION PROBLEMS

with Westinghouse Gearmotors

80% of all motor-driven machines, 1 hp and above, must operate at slower speeds than the motors which drive them.

Consequently, some type of speed reduction must be inserted between the motor and the driven machine. The best method of accomplishing this is by the use of Westinghouse Gearmotors which are slow-speed drives with high-speed motor efficiencies.

The product of more than 50 years of gearing experience, these Westinghouse units are designed, built, tested and guaranteed as single units.

Ask your Westinghouse representative about this new, efficient gearmotor. Consult with him about your present speed reduction problems or postwar plans.

Type C — A double-reduction unit for standard ratios from 7.6:1 to 25.7:1, inclusive.

Write for new gearmotor handbook, "Gearmotor Applications". Ask for B-3218. Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., Dept. 7-N.

J-07217

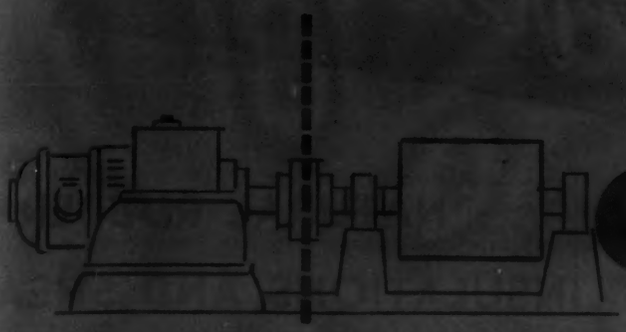
First of a series sponsored by Westinghouse to promote the use of gearmotors.

The New Westinghouse

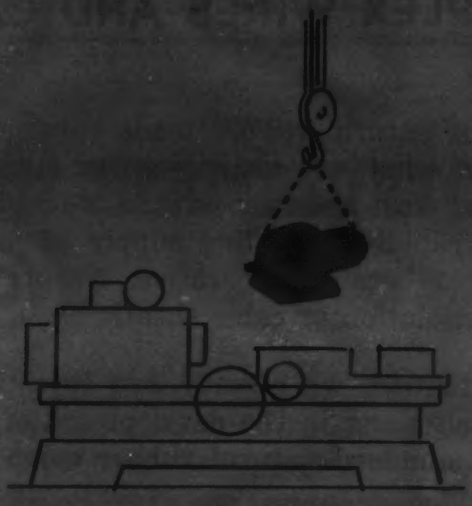
PLANTS IN 25 CITIES... OFFICES EVERYWHERE

A GEARMOTOR IS THE MOST EFFICIENT MEANS OF SPEED REDUCTION

Because it offers:



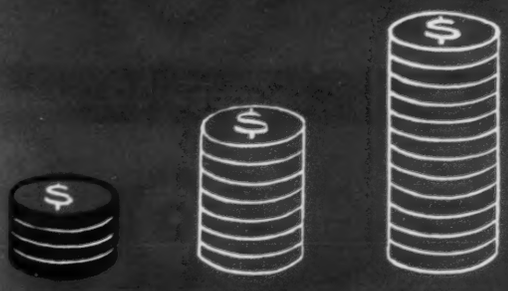
1 **COMPACTNESS . . .** it takes less space than any other form of parallel shaft speed reduction . . . makes belts, belt guards, pulleys, overhead line shafts *unnecessary*.



2 **LONG LIFE—MINIMUM MAINTENANCE.** A gearmotor has no belts, chains or ropes to replace . . . no multiple-parts to realign . . . no bearings to oil . . . no gears to grease. Probable maintenance consists of a twice-a-year oil change.

3 **EASE OF INSTALLATION.** By combining the prime mover and speed reducer in a single unit, the gearmotor is installed quickly and inexpensively.

4 **HIGH EFFICIENCY.** Only 2% power loss is involved in each stage of reduction . . . a single-reduction unit is 98% efficient; a double-reduction unit is 96% efficient. Compare this with the efficiency of other types of slow-speed drives.



5 **LOW OVER-ALL COST.** The initial installed cost of a gearmotor is usually lower than any other type of speed reduction. On the basis of maintenance and power losses, a gearmotor is *always* most economical.

6 **SAFETY FOR WORKERS.** A gearmotor has no exposed moving parts... no belts, pulleys, chains or ropes to endanger workers. It is totally-enclosed in a streamlined housing.

Gearmotors

Synthetic Rubber Replaces NATURAL RUBBER INSULATIONS AND SHEATHS ON SIMPLEX WIRES AND CABLES

Early in the war the scarcity of natural rubber made conservation necessary in order to make the best use of what was available. Our standards of quality and service had to be maintained with less rubber than we had been using. A few months ago, because of the rapidly dwindling supply of natural rubber, a complete change to synthetic rubber became imperative. Natural rubber could no longer be used in conductor insulation or cable sheath.

In anticipation of just such a situation, we already had investigated available substitute materials and were well along in the development of insulations and sheaths to replace all of our standard natural rubber compounds. The change-over is now practically complete.

A synthetic rubber compound has been provided to replace each of our special purpose, natural rubber insulations and sheaths. Laboratory tests and service records already indicate that they may be depended upon for trouble-free, efficient service. The technical and engineering skill that made our natural rubber compounds outstanding is now focused on obtaining even better quality and service with the new synthetic compounds.

If your postwar plans call for insulated wires and cables, or if you need them now for essential war work, it will be well worth your while to learn more about Simplex wires and cables with their new synthetic insulations and sheaths.

Simplex Wire & Cable Co., 79 Sidney Street, Cambridge 39, Mass.

Simplex WIRES and CABLES

Re-conversion *will not be a serious problem with us*

LIKE MOST other manufacturers, we have had to strain our facilities to the utmost to supply the demands of the present emergency. While some of the products we are producing for war purposes are "special," much standard Ⓕ Electrical Equipment has fitted perfectly into the war picture. And, where priorities permit, we are still manufacturing for non-war use. . . . At the same time, we have found it possible to continue with the development of new products. . . . So, when Victory comes, we will be able to turn at once to the production of equipment for industrial, commercial and residential use.

Among the new Ⓕ Products now available are

KLAMPSWITCHFUZ SWITCHBOARDS

These are assembled of standard units of similar or varied capacities, in either Dead Front or Safety Type Switchboards.

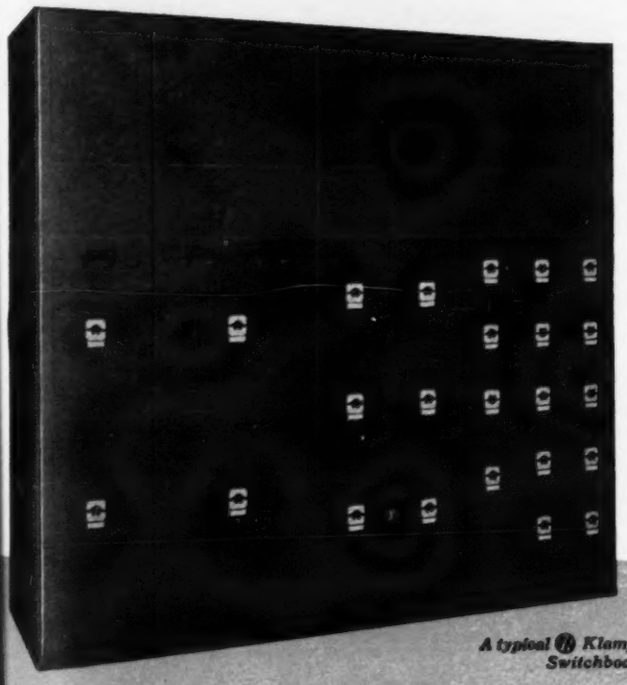
The face appearance of both is identical. The Dead Front type is open at the rear, which requires a protective grill to prevent access to current-carrying parts. The Safety Type is equipped with steel doors at the rear.

Each Ⓕ Klampswitchfuz unit is of the hinged type. The basic design is that of the knife switch—that is, the insertion of a blade into a contact clip. In the ON position the switch blades make *pressure contact* with the slots in the base, and are thus drawn tightly together at the fuse contacts. This, with the silver-plated contact parts, assures low-resistance to current flow.

Switch and fuse are combined in one unit, so that accidental contact with live parts is impossible when the door is closed.

Ⓕ Klampswitchfuz units are made in capacities of 30 to 1800 amperes, inclusive, 250 volts AC and DC, and 30 to 600 amperes, inclusive, 575 volts AC, in 2, 3 and 4 pole types, single and double throw. They are approved by Underwriters' Laboratories, Inc., as operating switches for 600 amperes and less, 250 volts AC and DC, and 200 amperes and less, 575 volts AC. All other capacities are approved as disconnect switches only.

Ⓕ Klampswitchfuz Switchboards are completely assembled at the factory, and shipped ready for connection of main feeder and branch circuit cables.



A typical Ⓕ Klampswitchfuz Switchboard

For the latest Engineering Data on Ⓕ Switchboards consult an Ⓕ Sales-Engineer. By long experience, he is competent to help Architects, Engineers and Specification Writers in problems of designing and specifying electrical installations. Write for name and address of the one nearest you. No obligation . . . Frank Adam Electric Co., Box 357, St. Louis, Mo.

EST. 1891 — THE SIGN OF A BETTER JOB

Frank Adam

ELECTRICAL PRODUCTS

for War Industry

FRANK ADAM ELECTRIC CO. ST. LOUIS, MO. U.S.A.

Then he said to himself—

"IMITATE IN GOOD THINGS"

THERE'S a sermon in the words of China's leader, Generalissimo Chiang Kai-Shek, as blue laws were clamped on his people's tendency to imitate our jitterbuggy way of life. Said he:

"CHINA IS FAR BEHIND THE WEST IN INDUSTRIALIZATION. WE WANT TO IMITATE THE WEST IN GOOD THINGS . . . WHY IN SUCH THINGS AS DANCING?"

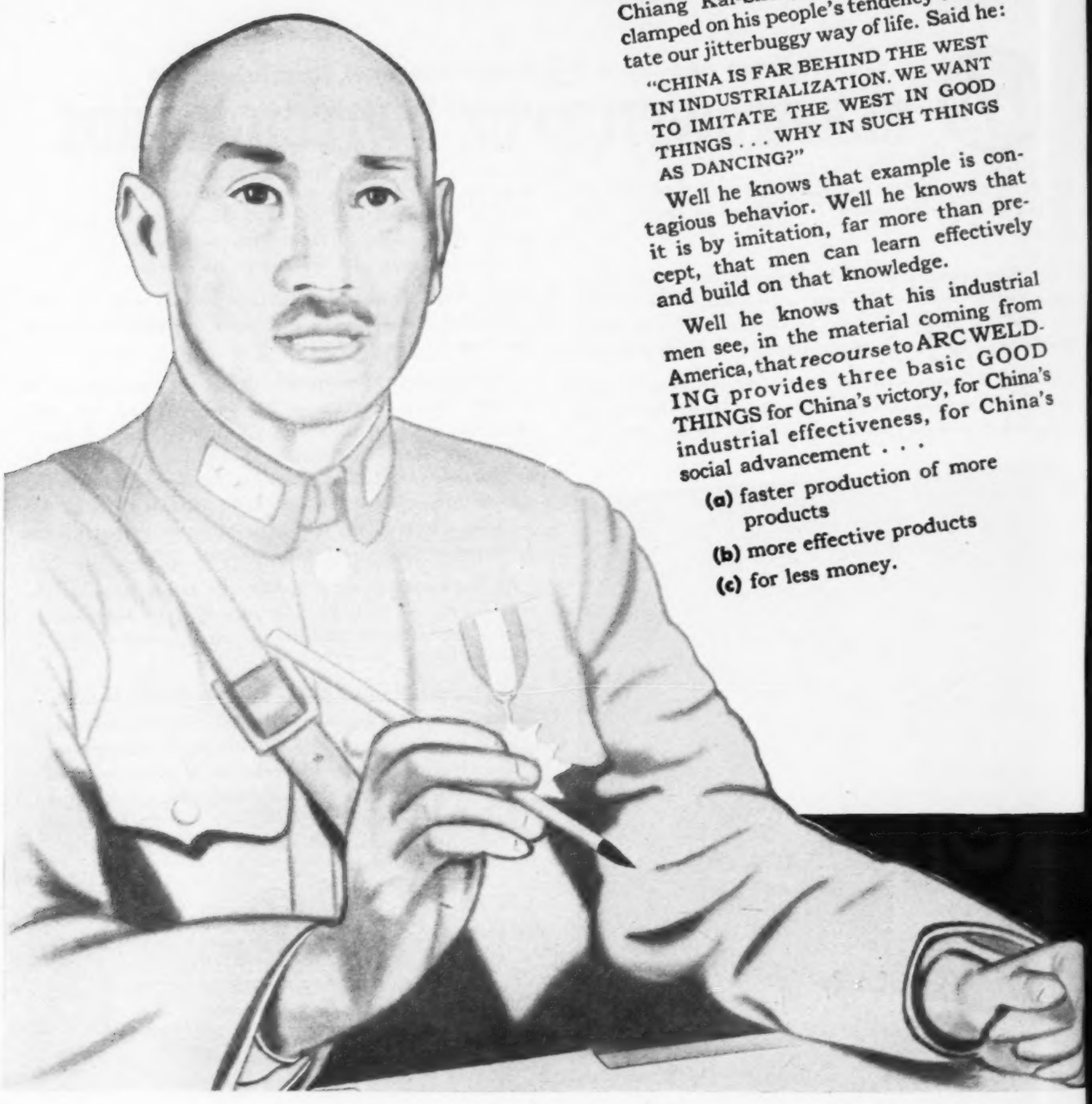
Well he knows that example is contagious behavior. Well he knows that it is by imitation, far more than precept, that men can learn effectively and build on that knowledge.

Well he knows that his industrial men see, in the material coming from America, that *recourse* to ARCWELDING provides three basic GOOD THINGS for China's victory, for China's industrial effectiveness, for China's social advancement . . .

(a) faster production of more products

(b) more effective products

(c) for less money.



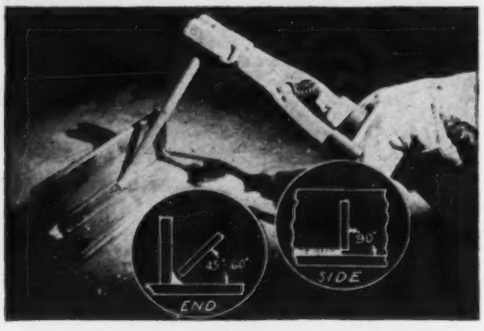
"Imitate in good things," he says

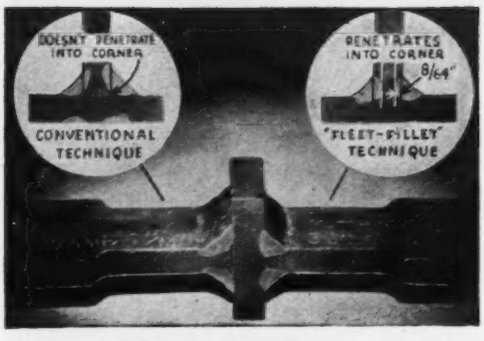
Here, Generalissimo, is a GOOD THING to imitate . . . the *faster production* being obtained by many aggressive users of this new Lincoln development:

A GOOD THING IN FILLET WELDING

The "Fleet-Fillet" Technique with "Fleetweld 11" has doubled the speed of many fillet welding operations. For example, 3/8" fillets, formerly made at 30 ft. per hr., are being "Fleet-Fillet" welded at 65 ft. per hr. In the comparison illustrated at the right, the fillets made by the "Fleet-Fillet" Technique have 70% as much deposited metal as those of conventional technique yet the "Fleet-Fillet" welds are 15% stronger.

Bulletin 432 gives complete details and procedures. Free on request.





HOW TO USE IT . . .

Procedure in applying the new technique consists of:

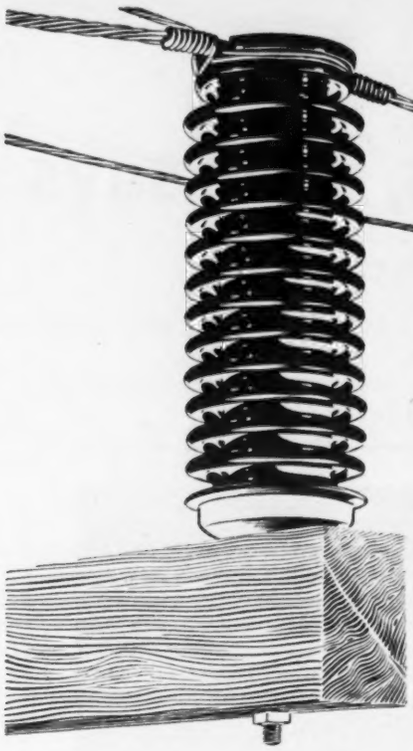
1. Hold electrode at an angle as shown in above illustration.
2. In general, use higher currents.
3. Advance electrode at higher speed.
4. Use electrodes recommended for the technique.

These general principles and their variations are discussed in Bulletin 432.

THE LINCOLN ELECTRIC COMPANY • Cleveland 1, Ohio

America's greatest natural **recourse**

ARC WELDING

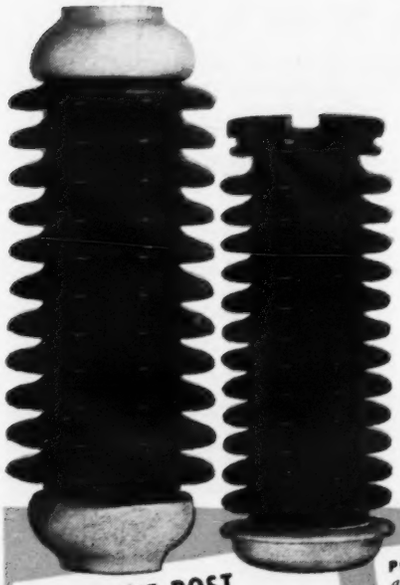


WARTIME CONSTRUCTION

need not be "TEMPORARY CONSTRUCTION"

TRANSMISSION LINES ON WOOD POLES AND LAPP LINE POSTS ARE LONG-LIFE, LOW-TROUBLE LINES . . . . . THAT GO UP FAST AND USE A MINIMUM OF MATERIAL

• On a cost-per-year basis, transmission line construction on wood poles with Lapp Line Posts is most practical and economical. And today, if load demands make it necessary for you to build a new line under war-emergency restrictions, you'll find this same construction will require least in critical materials, least in man power. The extra height of Lapp Line Posts will give your line better clearance, or even in some cases permit use of shorter poles. Coordinate necessity measures with your long-time planning and build low-cost long-service lines—on Lapp Line Posts



LAPP LINE POST and STATION POSTS on your system offer . .

POWER ARCOVER. *Flashover and leakage distances are not appreciably lowered by damage —even loss of several petticoats.*

NO PUNCTURE. *Puncture path in Lapp Post design is as great as flashover path. Insulator will flash over rather than puncture.*

NO CRACKING. *One piece post body, not subject to bursting from tension strains created by thermal changes in nested parts.*

RADIO INTERFERENCE. *By virtue of design factors alone, radio interference is permanently prevented at rated neutral voltage.*

NO CLEANING. *Fog-type design preserves uniform leakage path, prevents leakage flashover, makes the unit "self-cleaning."*

MECHANICAL RUGGEDNESS. *Stones or bullets deflect off, or rupture petticoats, leaving post body intact and insulator secure.*

Lapp

LAPP INSULATOR COMPANY, INC., LE ROY, N. Y.

"They're coming along fine

. . . but a light frost would ruin the whole crop!"

There's one critical period in the manufacture of huge herringbone gears for U.S. cruisers and destroyers when any marked change in temperature—whether heat wave or light frost—might send them to the scrap pile instead of into the fight.

You see, it takes many days to cut teeth for one of these big propulsion gears. And work done in the last hour must be as accurate in results as the very first cut. If, somewhere in the process, a temperature change causes uncontrolled expansion or contraction of the metal, it becomes impossible to maintain uniform precision.

In this case, G-E *air conditioning* and *industrial refrigeration* team up to keep production humming—regardless of weather. Air conditioning maintains uniform temperature in the cutting room. Industrial refrigeration cools the cutting oil. Together they eliminate the temperature hazards and permit precise matching of gears.

For exacting applications like these, General Electric has developed efficient and dependable air conditioning and refrigeration equipment that provides accurate control of temperature and humidity. Available for war production uses now . . . it will be available for all uses after the war.

☆ BUY WAR BONDS ☆

General Electric Company, Air Conditioning and Commercial Refrigeration Divisions, Section 444, Bloomfield, New Jersey.

Air Conditioning by

GENERAL ELECTRIC

Hear the General Electric Radio Programs: The "G-E ALL-GIRL ORCHESTRA", Sundays, 10 p.m., EWT, NBC . . . "THE WORLD TODAY" News, Every Weekday 6:45 p.m. EWT, CBS

FOR LASTING, DEPENDABLE SERVICE...

rely on these 6 advantages of Transite Ducts

Inorganic . . . made of an asbestos and cement composition compressed under great pressure. This provides permanence and strength. These ducts are also immune to rust and rot.

Permanently smooth bore . . . long cable pulls and replacements are made easier. Danger of damage to cables is minimized.

Easily and quickly installed . . . long, light-weight lengths and simple assembly method assure rapid, economical installation.

Immune to electrolysis . . . being entirely inorganic and non-metallic, these ducts are not affected by electrolysis or galvanic action.

Lower cable temperatures . . . an advantage resulting from a relatively high rate of heat dissipation.

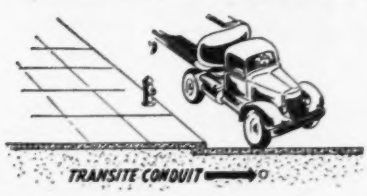
Incombustible . . . won't contribute to the formation of dangerous smoke, gases, or fumes. If burnouts do occur, these inorganic ducts provide maximum protection to adjacent cables and permit easy removal of damaged conductor.

For complete details on Transite Ducts, write for Data Book, DS-410, Johns-Manville, 22 East 40th Street, New York 16, N. Y.

JM PRODUCT

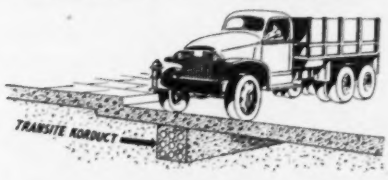
JOHNS-MANVILLE *TRANSITE DUCTS*

TRANSITE *CONDUIT*



Designed for exposed work and for use underground without a concrete encasement.

TRANSITE *KORDUCT*



For use in concrete. Thinner walled, otherwise identical with Transite Conduit.

YOUR TWO BEST BETS ON ALL INSULATING PROBLEMS

TAP THE "HOW-TO-DO-IT" ABILITY OF YOUR WESTINGHOUSE DISTRIBUTOR

Your Westinghouse distributor offers two quick solutions to your electrical insulating problems.

First: The complete Westinghouse line of "Tuffernell" Insulating Materials—proved by 50 years of field tests with every type of electrical equipment.

Second: The distributor's own "how-to-do-it" ability representing knowledge drawn from Westinghouse insulating headquarters and experience gained in similar applications for countless other customers.

Your Westinghouse distributor stocks a line of insulating materials that's really complete . . . from varnishes and cements to fabrics and tapes. And every material is "Tuffernell"—exactly what you need in flexibility, dielectric and mechanical strength.

J-90509

GET THIS NEW CATALOG

To simplify selection of the right insulation—your Westinghouse distributor now has available the new Westinghouse "Insulating Material Catalog". It contains listings of micas, fabrics, tapes and papers, along with complete dimensions, ratings and other helpful application data. Ask today for your copy of Catalog 65-000. Or, write Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., Dept. 7-N.

Westinghouse

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

SEE YOUR WESTINGHOUSE DISTRIBUTOR *FIRST!*

22 Service Trips Saved Will Buy a KYLE Oil Circuit Breaker

Every time a line outage requires you to send your service man out to restore service on a feeder line it costs you a minimum of $4.50. It ties up a man's time . . . it wears out your truck and your tires. The interrupted service makes the customer mad.

The Kyle Oil Circuit Breaker will automatically restore service after temporary faults that make up 85% of line difficulties. By operating one, two and three times before locking out, the Kyle Circuit Breaker will make unnecessary the great majority of such service trips . . . immediately restore service that might otherwise take hours.

It only takes 22 such trips to pay for a Kyle Oil Circuit Breaker that will give this

And Here is How the KYLE

It only takes 22 such trips to pay for a Kyle Oil Circuit Breaker that will give this dependable, trouble-free protection to your lines for many years. Add up the number of this kind of trips your men made last year. Multiply them by $4.50 and you will have some idea of the savings that Kyle Oil Circuit Breakers can give you.

In these days when manpower is a problem, when trucks, tires and other equipment are too valuable to waste, it is more important than ever to install Kyle Oil Circuit Breakers.

Furthermore, The KYLE Oil Circuit Breaker Has These Distinct Advantages

The Kyle Oil Circuit Breaker is the only circuit breaker which makes use of dependable hydraulic timing . . . no complicated clockwork mechanisms . . . no motors. Kyle Circuit Breakers are safe . . . triple safe. The normal position of the breaker is the safe, open position with the handle (1) down. The operating handle and tank are always dead. There is no terminal in the bottom (2) of the tank. Kyle Oil Circuit Breakers are easy to handle, easy to mount with standard transformer tools.

And Here Is How the KYLE Circuit Breaker Operates...

These two pistons are the operating heart of the Kyle Oil Circuit Breaker—the heart of its dependable hydraulic timing system—no other breaker is so timed. The retard piston (4) is attached to the contact closing mechanism through the Bakelite tie link and rides in the cylinder as shown. The piston moves up as the contacts open. Reclosing of the contacts is hydraulically delayed by restricting the oil flow past the piston while in the upper cylinder. When the piston reaches the lower cylinder, free drop results in fast closing of the contacts.

The release piston (3) is actuated upward by the pumping of oil under the piston in measured amounts. The plunger acts as a pump, making an injection each time the breaker opens. After four operations in succession the piston is driven high enough to trip the release latch, opening the breaker to the lockout position. If it is not necessary for the breaker to lock out, the release piston settles back to its initial position, resetting the breaker for another complete cycle of operations.

RATINGS OF THE KYLE OIL CIRCUIT BREAKERS

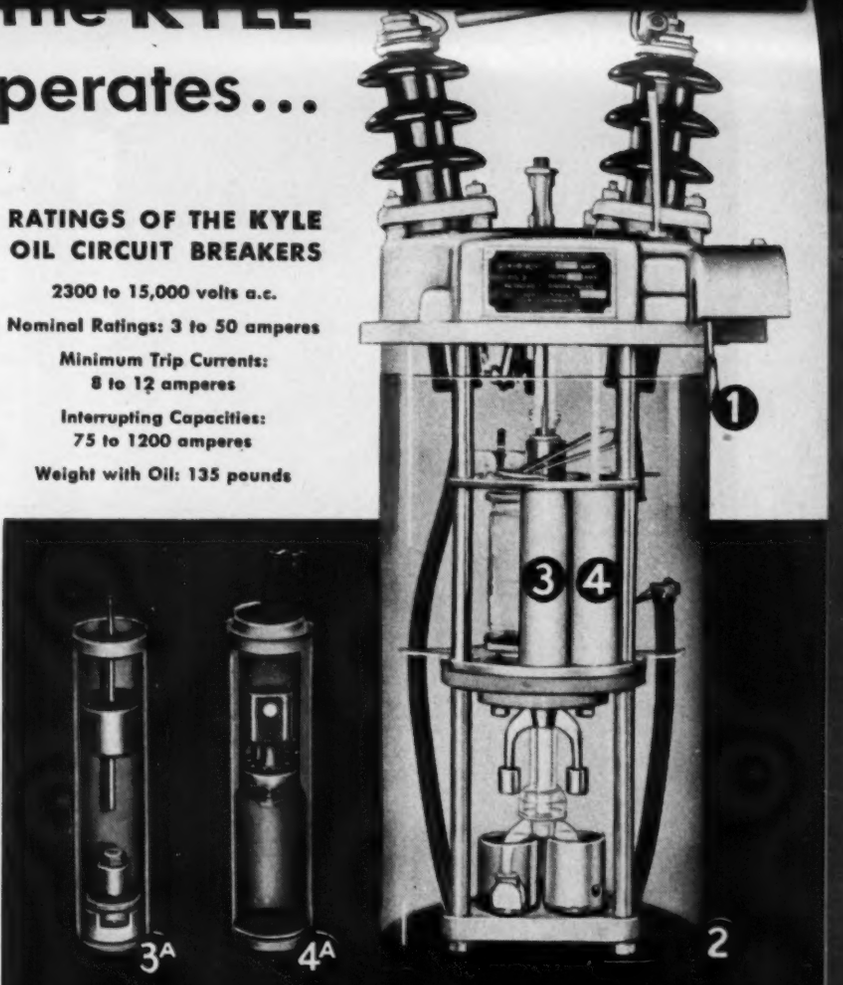
2300 to 15,000 volts a.c.

Nominal Ratings: 3 to 50 amperes

Minimum Trip Currents: 8 to 12 amperes

Interrupting Capacities: 75 to 1200 amperes

Weight with Oil: 135 pounds



KYLE CORPORATION

SOUTH MILWAUKEE, WISCONSIN

Your linemen can save you money...

with Bethlehem's new serving tool

Patents Pending

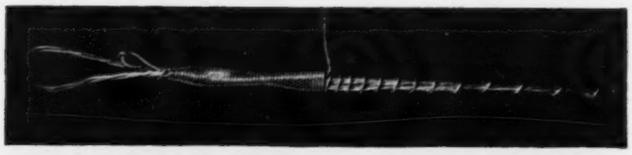
Here's a new, speedy, inexpensive way to make dead ends on bethanized strand and Ruralductor. With Bethlehem's handy serving tool, linemen can quickly form a tightly-wound dead end connection that will hold above the useful strength of the strand.

Consider these advantages of the new Bethlehem "dead end coil" method of making dependable connections:

1. The tool maintains controlled tension, with minimum displacement of the bethanized coating. This is because the electrolytically-applied bethanized coating is tight, ductile and uniform. This technique is recommended for use only with bethanized strand or Ruralductor, since the holding power of this dead end is not always reliable with other coatings.

2. Any lineman can quickly learn to use the serving tool. He simply takes an inexpensive coil of 11-gauge bethanized dead end wire, winds 5 turns with the tool—and that's that. There are numerous applications for this dead end—two of them are shown below. The tool will serve bethanized strand of any grade, in Class A, B and C coatings, without materially impairing corrosion resistance.

Plan to use this money-saving combination—bethanized strand or Ruralductor and the new Bethlehem serving tool—for your next installation. You can obtain full information from the nearest Bethlehem office, or by writing direct to Bethlehem Steel Company, Bethlehem, Pa.



Vibration-Dampening Dead-End Assembly—For three-strand Ruralductor, with jumper wire firmly secured.

Dead-End Assembly with Stirrup for Hot Line Clamp—The jumper wire is shaped into a loop, to take the hot line clamp.

One way the serving tool was tested

A number of completely inexperienced men made serves, after watching *one* demonstration of the new serving tool. In subsequent tests, all specimens held beyond the useful strength of the strand.

★ BETHLEHEM STEEL ★

"modern packaging"

TRUMBULL CONTROL CENTERS

EASIER to BUY in "modern" packages. This is the NEW and better way to buy electrical control equipment. You order standardized stock units where once you had the expense and delay of "special engineering". You get exactly what you want for the job to be done . . . PLUS unlimited flexibility in planning for future extensions or changes.

EASIER to install. Trumbull Control Centers can be installed in *hours* where old time installation took days or weeks. First, the prefabricated bus bar vertical sections, which carry power, are lined up and connected to mains. Then the necessary combinations of control units are simply "plugged in" to the sections. That's all there is to it. Installation may be back-to-back or flat against walls because everything is accessible from the FRONT.

EASIER to extend, rearrange or relocate. Trumbull Control Center installations are as flexible in this respect as a "row of filing cabinets". You can add or remove sections; you can rearrange control units within the sections. You can rearrange the entire installation if your shop power requirements change in the future.

EASIER to provide adequate protection against shutdowns . . . first through centralized group control that assures a uniformly high standard of electrical safety for *all* equipment in a department. Secondly, by isolating one department or plant section from another as far as electric power is concerned.

EASIER TO SERVICE. All dead front construction . . . all units and entire mechanisms inspectable and removable *from front* . . . wiring connections easily made *from front.*

EASIER TO LOOK AT. Thin cross section, totally enclosed, beautifully finished in machine gray enamel, Trumbull Control Centers are the "show pieces" of most plants where they are installed. Good looks are important . . . and especially so when they are the result of correct design, expert construction and high quality throughout.

Write for Trumbullaid Bulletin No. 411.

TRUMBULL
CONTROL CENTERS

THE TRUMBULL ELECTRIC MANUFACTURING COMPANY • PLAINVILLE, CONN. • A GENERAL ELECTRIC ORGANIZATION

OTHER FACTORIES AT NORWOOD (CINN.) O. — SEATTLE — SAN FRANCISCO — LOS ANGELES

A Challenge to the Future ... in Motor Design

Copperspun ROTOR

Here is the new Fairbanks-Morse general purpose, continuous duty motor—designed for the future—available now! Never have more stamina, versatility and protection been built into a motor housing!

BUY WAR BONDS

NOTE THESE FEATURES

- **It is a 40°C. motor.**
- **It is a protected motor.**
- **It has an optional conduit box assembly.**
- **It has cross-flow ventilation.**
- **It has ball bearings—sealed in cartridge type closures.**
- **It has exclusive Fairbanks-Morse *COPPERSPUN ROTOR.***

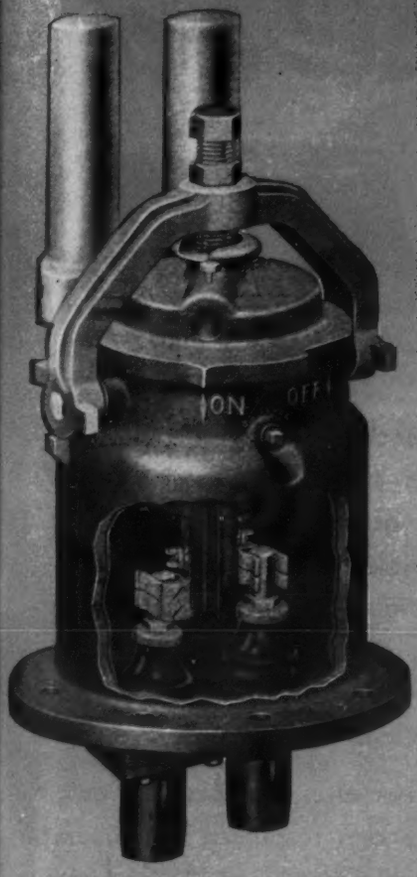
Write Fairbanks, Morse & Co., Fairbanks-Morse Building, Chicago 5, Illinois.

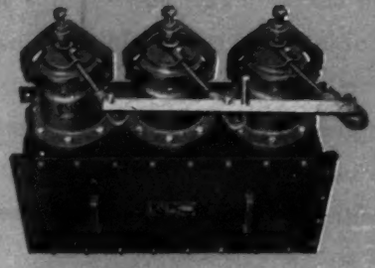
FAIRBANKS-MORSE

DIESEL ENGINES
PUMPS
MOTORS
GENERATORS
WATER SYSTEMS
SCALES
STOKERS
FARM EQUIPMENT
RAILROAD EQUIPMENT

Motors

STYLE "B"
With gasketed flange for mounting on boxes.





The years of trouble-free service has created a wide acceptance of G & W Type "FC" Oil Fuse Cutouts. The modern design provides interchangeability of parts for various installation conditions. The interlocking cover and cover clamp insures safety in fuse replacement. The simple and inexpensive fuse link universally fits all Type "FC" cutouts.

½ cycle interruption of short circuits protects equipment.

Beryllium copper springs make ideal full load break switching contacts.

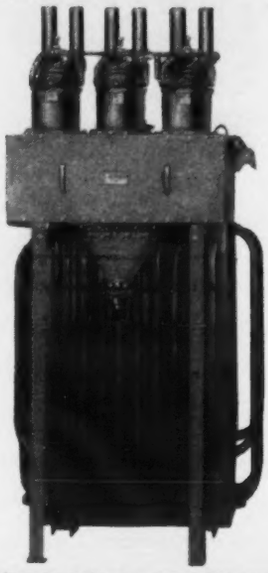
Save Installation Labor

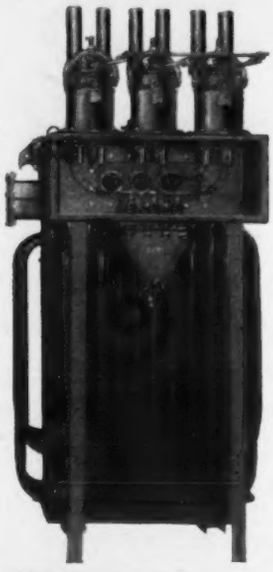
By Specifying

G & W TYPE "FC" OIL FUSE CUTOUTS

on your transformers

FULL COOPERATION WITH TRANSFORMER MANUFACTURERS IS ASSURED





Transformers manufactured by Kuhlman Electric Co.
Equipped with G & W FC42B oil fuse cutouts.

Secure the advantages of complete unit metal enclosed construction with CUT-OUT BOX attached to the transformer.

Installation labor is reduced by merely terminating the feed cables in potheads (*also made by G & W*) or within the cut-out insulators inside the box. Conduit connections can be made on the pothead or directly on the box.

An economical primary load-break oil switch with overload and short circuit fuse protection.

Send for Bulletin 425

G & W ELECTRIC SPECIALTY CO.
7780 DANTE AVENUE • CHICAGO 19, ILL., U. S. A.

In Canada—Powerlite Devices, Ltd., Toronto

GANG OPERATED } **FOR FUSING AND SWITCHING PRIMARY CIRCUITS SUBWAY–OVERHEAD–VAULTS**

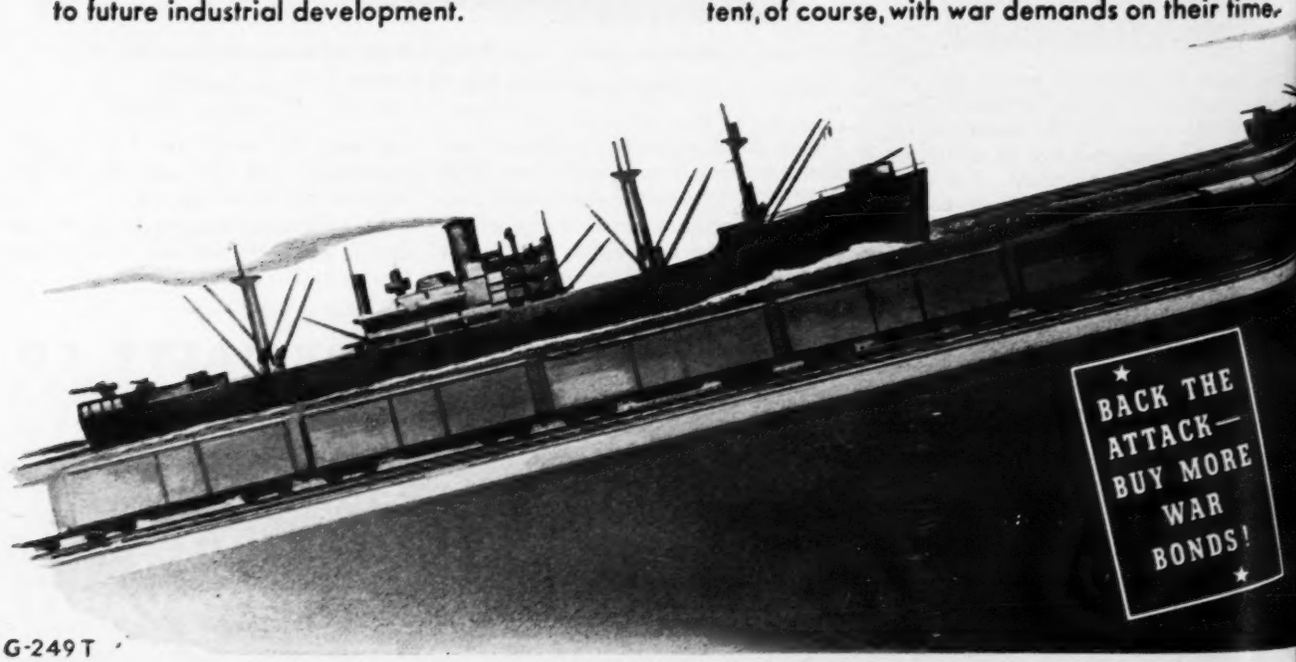
Rebuilding a World ...
for STEAM

The tough tasks of steam plant rehabilitation and development, will fall on engineers who are now serving their country in the armed forces, or in the never-ending battle with power-plant problems in war plants and in public utility plants supplying power to war plants. In this they are applying their engineering knowledge and skills to the early conclusion of hostilities.

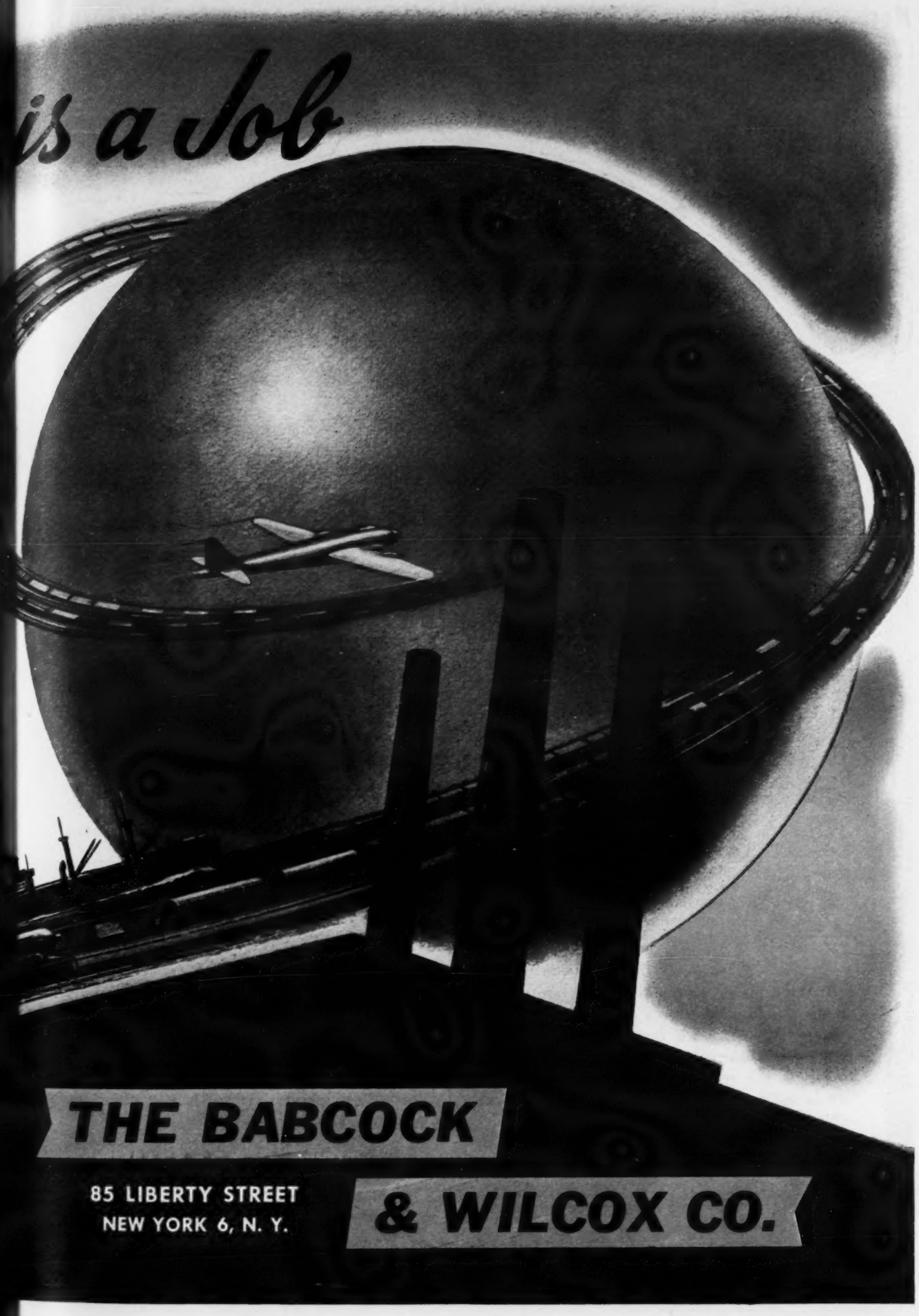
When the war will have ended and Victory is ours, these engineers will re-direct their knowledge and skills from war-making activities to the production of steam power for peaceful pursuits, utilizing whatever of their background of war experience is applicable to future industrial development.

We of Babcock & Wilcox have implicit confidence in their resourcefulness, confidence in their ability to continue overcoming almost impossible assignments. Serving other engineers has also kept us on our mettle, as evidenced by important B&W contributions to the continued evolution of practice in steam generation.

While the war effort has first call on your industry's time and resources, you undoubtedly have given some thought to the postwar power-plant problems that will confront you, as it is never too early for engineering planning. B&W engineers will gladly cooperate with you to the utmost of their ability, consistent, of course, with war demands on their time.



G-249T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THE BABCOCK
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Here's a convincing Guarantee of Westinghouse Insulator Performance

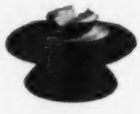
81.25%

OF ALL MAJOR DESIGN DEVELOPMENTS IN ELECTRICAL PORCELAIN HAVE BEEN MADE BY

Westinghouse

FARADOID PRINCIPLE improved performance of high-voltage transmission lines. Surfaces were proportioned to conform to the equipotential surfaces of the electrostatic field. Now an industry-wide standard.

HIGH-STRENGTH SUSPENSION developed to meet demands of railroad electrification. Increased load limits of suspension insulators to 25,000 and 36,000 pounds. Made possible improvements in power transmission.



RADIO-INTERFERENCE-PROOF (R.I.P.) INSULATORS, first introduced in 1930. Solved the radio reception problem caused by the usual arcing flow of capacity currents between conductor and insulator surfaces. Now an industry standard.

SOLDER SEALING is to this day the only effective means of producing a hermetic joint between metal and porcelain. Gives permanent protection to oil or air-insulated equipment against moisture or dirt.

BULLET-PROOF INSULATORS increased section thickness, and proportioned surfaces so as always to produce ricochet. Helped solve breakage due to stone throwing and target shooting.

PRESTITE—a revolutionary new porcelain, dense, nonporous with high dielectric and mechanical strength. Can be molded to intricate shapes with close tolerances.

LINE AND STATION POST INSULATORS—a co-development of Westinghouse and other engineers.

If the 8 major porcelain developments made in the past quarter century are given an equal rating, Westinghouse must be credited with 81.25% of these important improvements!

That's the record. Westinghouse quotes it, not in self-praise, but as a guide to men responsible for porcelain performance.

The research and co-ordinated engineering which made possible these advances are today at work on new projects. You are invited to co-ordinate these research facilities with your own porcelain problems and planning.

To serve your immediate porcelain insulator needs, Westinghouse maintains over 120 stocking points which assure quick delivery anywhere in the United States. Your inquiries on either present or postwar needs will be welcomed. Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., Dept. 7-N.

J-05153

Westinghouse

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

INSULATORS

Only HENDY DIESELS Combine all these Features!

GENERAL SPECIFICATIONS
SERIES 50

Bore—12"; Stroke—15"
Speed—350 to 600 RPM
Rated Power at 450 RPM—
75 hp. per cyl.

Write for complete data on the Hendy Series 50 Diesel Engine

- Unit-type fuel-pump injectors
- Dual alloy-steel intake and exhaust valves
- Jet action cooling in cylinder head
- Cross-heads which eliminate side thrust from rocker arm
- Hydraulic tappets that eliminate valve adjustments in service
- Overhead-type camshaft
- Centrifugally cast, babbitt-lined, steel-backed bearings
- Double bearing at flywheel end
- Rigid steel engine bed
- Welded-steel cylinder block with sleeve liners
- Forged-steel or cast-alloy crankshaft
- Forged-steel connecting rods
- Oil-cooled cast-iron pistons
- Cage-type relief valve and compression release
- Improved type camshaft chain drive system
- Auxiliaries engineered to suit application
- Integral fresh-water cooling
- Positive, full-automatic lubrication
- Mechanical or hydraulic governing
- Water-cooled exhaust manifold
- Starting and operating controls centralized at gauge board
- Friction clutch for power takeoff, as optional equipment

For simplicity—long life—for modern design—look to Hendy!

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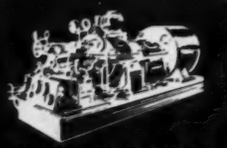
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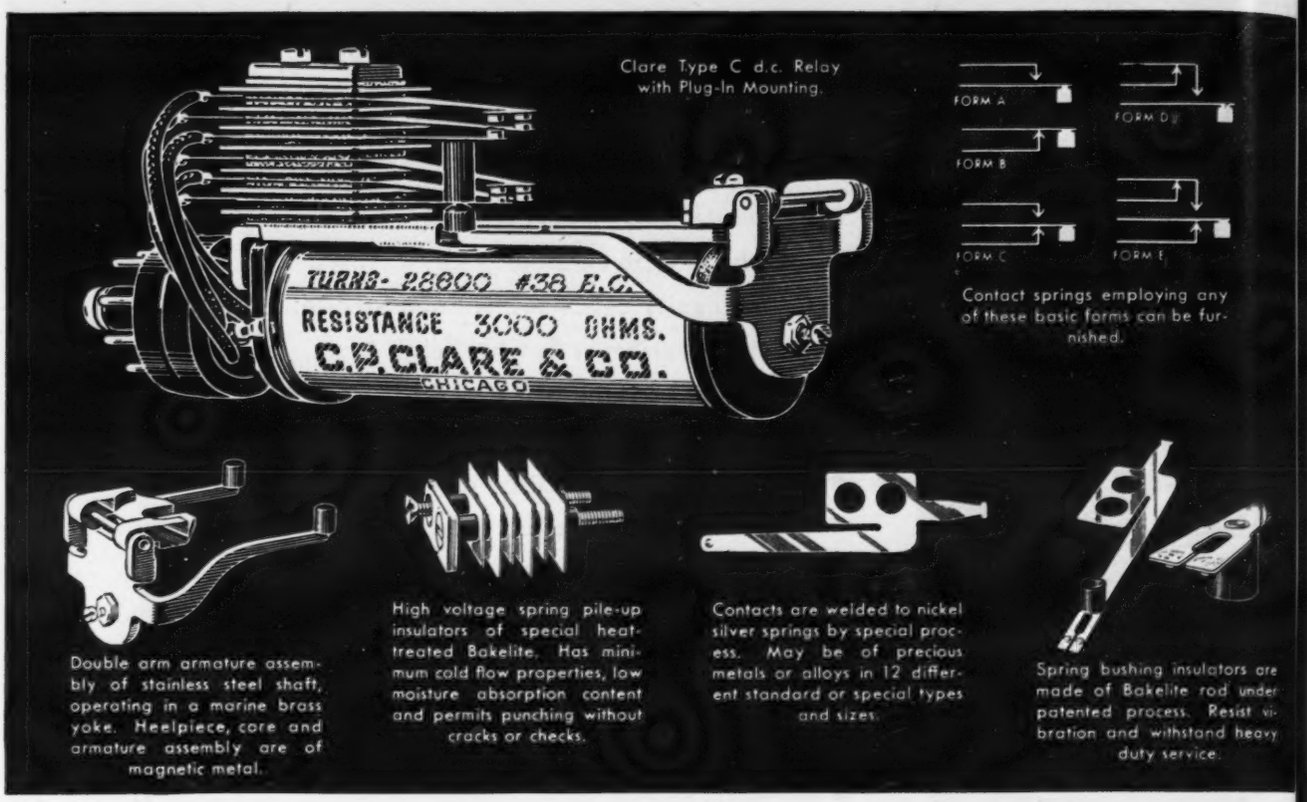
Flexible . . .

CLARE "CUSTOM-BUILT" RELAYS

Meet Most Exacting Utility Demands


Clare Type C d.c. Relay with Plug-In Mounting.
TURNS- 28800 #38 E.C.
RESISTANCE 3000 OHMS.
C.P.CLARE & CO.
CHICAGO
FORM A
FORM D
FORM B
FORM C
FORM E
Contact springs employing any of these basic forms can be furnished.
Double arm armature assembly of stainless steel shaft, operating in a marine brass yoke. Heelpiece, core and armature assembly are of magnetic metal.
High voltage spring pile-up insulators of special heat-treated Bakelite. Has minimum cold flow properties, low moisture absorption content and permits punching without cracks or checks.
Contacts are welded to nickel silver springs by special process. May be of precious metals or alloys in 12 different standard or special types and sizes.
Spring bushing insulators are made of Bakelite rod under patented process. Resist vibration and withstand heavy duty service.

The Clare Type "C" Relay shown here may be "Custom-Built" to provide exactly the contact arrangements, the spring assemblies, or the type and size of contacts your special utility application calls for.

This flexibility of Clare Type "C" Relays permits any combination of five basic contact forms; provides twelve different standard, or other special, types and sizes of contacts.

Utilities have found this rugged, multiple contact relay especially valuable for use in operating control panels, supervisory control boards and load dispatching centers where signals are indicated from remotely located switches, circuit breakers, network protectors and other equipment.

All Clare relays are carefully designed, well manufactured from best materials and precisely adjusted. These factors result in a relay which reduces overall relay cost, simplifies installation and insures better and more dependable performance.

Clare engineers are ready at all times to assist you in developing a relay specifically "custom-built" to meet your requirements. Send for the Clare catalog and data book. C. P. Clare & Company, 4719 Sunnyside Avenue, Chicago (30), Illinois. Sales engineers in all principal cities. Cable address: CLARELAY.

C L A R E R E L A Y S

"Custom-Built" Multiple Contact Relays for Electrical, Electronic and Industrial Us

VICTIMS OF A "MECHANICAL BRAIN"

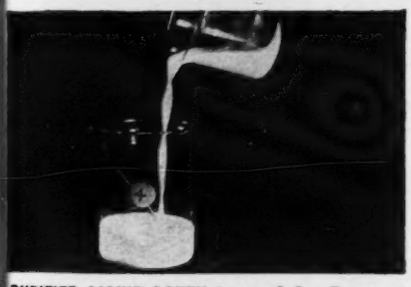
Zeros knocked out of the sky at the rate of one to every 90 rounds of ammunition fired! That's the feat our anti-aircraft batteries are performing in the South Pacific. During World War I, the average was but one plane to every 17,000 rounds.

Credit is due largely to the new M9 gun director—a "mechanical brain" that aims a battery of four 90mm. guns and sets their fuses. Everything is done mathematically by electricity.

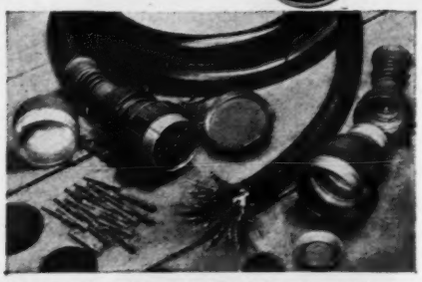
The delicate synchronization of tracker, height finder, computer, power rectifier and altitude converter depends on scientific perfection of the electrical cable.

Laytex Portable Cable, developed by U.S. Rubber Company engineers, is used throughout. It transmits the data for lightning-fast calculation without chance of human error, resulting in fire control of deadly accuracy. Results attest how exactly this cable meets this specialized need.

Laytex WIRES AND CABLES SERVING THROUGH SCIENCE



PURIFIED LIQUID LATEX is used for Laytex Wire and Cable Insulation. A special process removes moisture and water-soluble impurities. Laytex insulation—whether made from either natural or synthetic rubber—has exceptional dielectric strength.



CABLE AND PLUG ASSEMBLY for the M9 gun director. Laytex Insulation developed by U.S. Rubber Company engineers is built up into a homogeneous unit around the perfectly centered wires by an exclusive process of repeated dipping and drying, followed by vulcanization.

TOMORROW'S PROMISE — Although the entire output is still going to meet critical war needs, a day will inevitably arrive when we shall again supply U. S. Laytex Wires and Cables for Buildings, Police and Fire Alarms, Communications, Signalling, Power and Control.

Listen to the Philharmonic-Symphony program over the CBS network Sunday afternoon, 3:00 to 4:30 E.W.T Carl Van Doren and a guest star present an interlude of historical significance.

UNITED STATES RUBBER COMPANY

1230 SIXTH AVENUE, ROCKEFELLER CENTER, NEW YORK 20, N. Y. • *In Canada:* DOMINION RUBBER CO., LTD.

Wagner

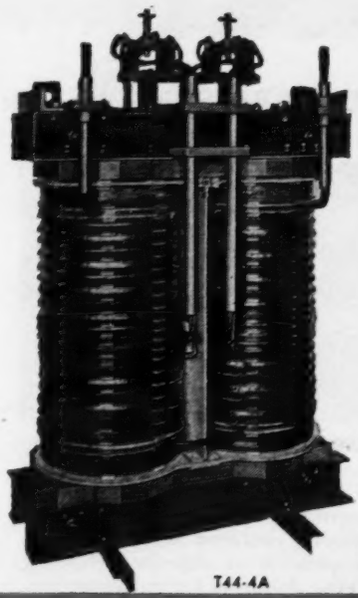
SUBSTATION TRANSFORMERS

Wagner transformers installed in a typical substation feeding rural distribution lines.

Throughout the country many transformers, which are serving in substations feeding rural distribution systems from higher-voltage transmission lines, are overloaded due to the great increase in the number of farms being electrified.

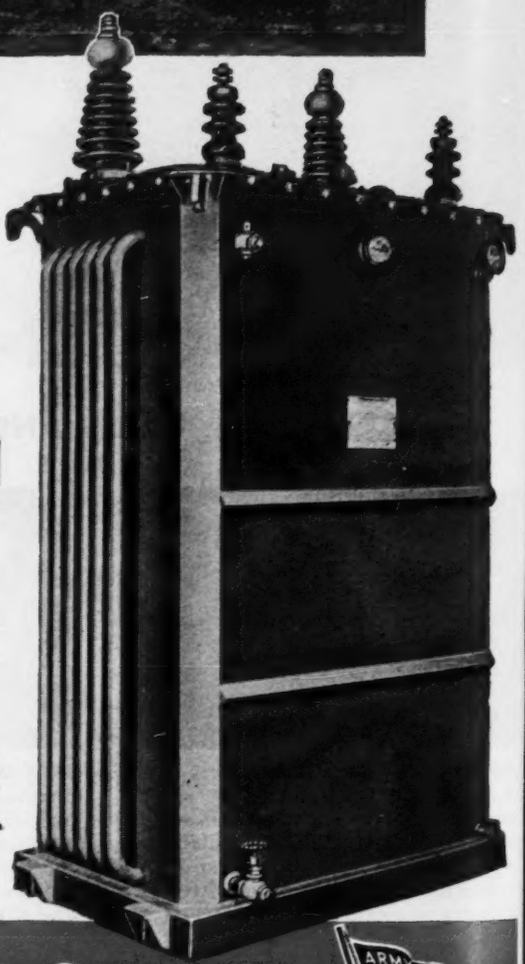
Eventually these transformers must be replaced, so if your substation transformers are overloaded you should make plans to replace them with Wagner transformers. For long life and dependability Wagner transformers are unsurpassed.

Write for Bulletins TU-180 (Distribution), and TU-181 (Power). They are yours for the asking.



T44-4A

Typical core-type element used in Wagner substation transformers. High-voltage side shown in illustration. Wagner substation transformers are available in all standard kva sizes and voltage ratings.



MOTORS
TRANSFORMERS
UNIT SUBSTATIONS
INDUSTRIAL BRAKES
BRAKE LINING

Wagner Electric Corporation

ESTABLISHED 1891

6456 Plymouth Avenue, St. Louis 14, Mo., U. S. A.

ELECTRICAL AND AUTOMOTIVE PRODUCTS

LIFE-SPAN

Full-Length Tox-i-tized Cedar Poles
Sold only by the following

NAUGLE POLE & TIE CORP.
Minneapolis, Minn.

PAGE AND HILL CO.
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B. J. CARNEY & CO.
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SCHAEFER-HITCHCOCK CO.
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Supplier for Joslyn

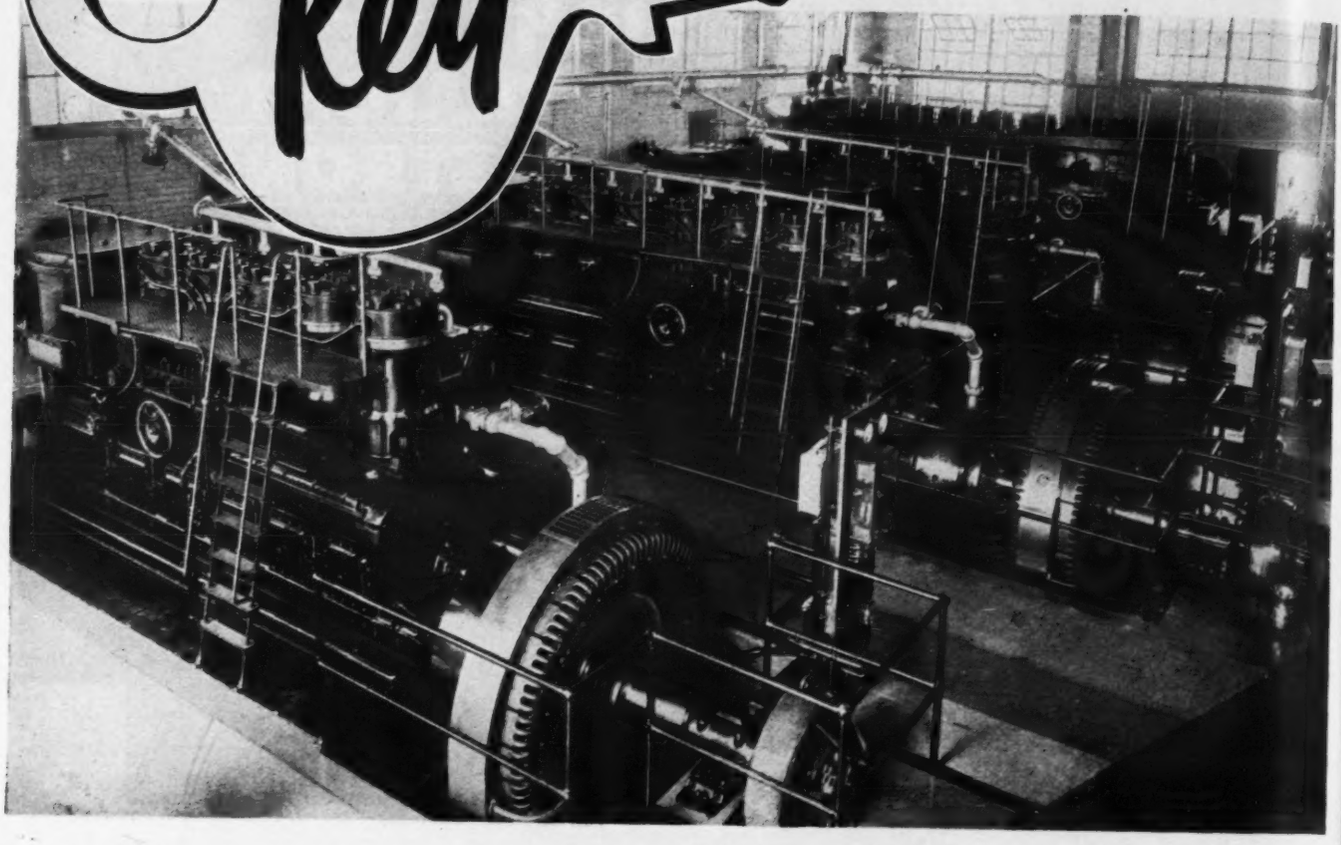
LIFE-SPAN TOX-I-TIZING Adds Extra Years of Service

If Nature had built cedar poles to meet utility specifications she couldn't have done a better job of providing the basic qualities that go to make good pole structure: namely lightness, straightness, soundness, strength and low gravity center. To these natural advantages of cedar poles, science now has added an extra span of dependable service life. All Life-Span Cedar Poles receive a full-length toxitizing treatment in addition to the regular creosote butt treatment. This extra toxic protection means lasting decay immunity from top to butt and from outer surface to heartwood. For longer pole life, for low maintenance costs—the pole to specify is "Life-Span".

CONSOLIDATED TREATING CO.

Minneapolis **Minnesota**

A Key to BETTER MAINTENANCE



Continuous operation, excessive wear, and today's replacement difficulties demand *better maintenance* of power units.

A key to better maintenance is *better lubrication.*

Sinclair Rubilene Oils are specially designed for better lubrication of *DIESEL ENGINES.* Rubilene seals compression . . . reduces ring wear . . . provides *safe* lubrication under continuous heavy loads.

Rubilene non-gumming, sludge-resistant qualities afford lengthened operating periods between overhauls.

Where prolonged heavy duty operation threatens severe wear on rings and cylinders, Sinclair Rubilene Oils make for *better maintenance.* Consult us about your lubrication problems.

(Write for "The Service Factor" — published periodically and devoted to the solution of lubricating problems.)

SINCLAIR INDUSTRIAL OILS

FOR FULL INFORMATION OR LUBRICATION COUNSEL WRITE SINCLAIR REFINING COMPANY (INC.), 630 FIFTH AVENUE, NEW YORK 20, N. Y

Scovill Tube News

Vol. 2 SCOVILL MANUFACTURING COMPANY, Waterbury 91, Conn No. 4

Corrosion of Condenser Tubes ...Causes and Cures

Scovill offers two folders on obtaining longer tube life

Among the common causes of corrosion in condenser and heat exchanger tube metal are the following, each of which is discussed in two folders which have been prepared by Scovill Manufacturing Company engineers as one of three Scovill services to power plant operators:

Film Formation

The ability of copper and its alloys to form protective films on their surfaces explains their inherently excellent corrosion resistant properties. In order to be protective, the film must be adherent, continuous and relatively insoluble. The formation of soluble salts at the metal surface will lead to continued corrosion. Likewise, coatings which are porous, loosely adherent, friable or easily broken, or discontinuous, offer little protection to the metal.

Accelerated Uniform Corrosion

Tubes in service under conditions which result in corrosion at the tube surface with the formation of soluble salts only, will undergo a uniform thinning of the tube wall. This is often experienced in acid solutions, particularly with oxidizing acids or acid solutions containing oxygen or an oxidizing agent. Solutions which have a definite solvent action on the products of corrosion of copper alloys, such as solutions containing ammonium hydroxide or cyanides, would behave similarly.

Impingement Attack, End Corrosion, etc.

Rapid and repeated destruction of protective surface films usually occurs at or near the inlet end of the tubes and is variously described as "impingement attack, end corrosion, etc." There are usually certain localized areas in a unit or sections of a unit where failures from this cause predominate. The destruction of protective films at such localized areas is due to a relatively high velocity of the circulating medium, together with a turbulent condition and the action of entrained or separated air.

Concentration Cell Action

Many cases of localized corrosion and failure of condenser and heat exchanger tubes are due to local differences in solution concentration or composition which may develop at the metal surface. A break in an otherwise satisfactory protective film may initiate such action. Cracks, crevices or other small openings at baffle or support plates where liquids may seep and become trapped are always a potential source of trouble in this respect.

Deposit Attack

Corrosion of the "deposit attack" type (a special form of "concentration cell" action) is directly due to the settling out or lodgment on the tube wall of sand, mud, coke, stones, wood, shells, flakes of iron scale, etc. Part of the metal surface becomes shielded or protected by the deposit and usually becomes anodic to adjacent metal areas; intense pitting at such shielded areas is likely to occur. If the deposit is of sufficient size to interfere seriously with the flow of the circulating medium, turbulence, air separation and erosion-corrosion of the down-stream side of the tube may take place.

Plug- and Layer-Type Dezincification

Brasses containing less than 85% of copper may undergo corrosion which results finally in the gradual replacement of the brass by a spongy, porous copper deposit. This deposit may occur locally, developing into "plugs" of copper, or it may occur uniformly over the tube surface — in which case it is designated as "layer-type" dezincification. Conditions which favor dezincification of condenser tubes are:

(1) Contact with waters slightly acid in character and of a low degree of aeration.
(2) Relatively low velocity of water over the tube surfaces, or stagnant water in tubes.
(3) Relatively high temperatures.
(4) Certain types of permeable scales on the metal surface.

Galvanic Action

The indiscriminate use of dissimilar metals and alloys in any service, when they make good contact and are also subjected to a conducting medium, may lead to the early failure of one member of the couple. In the design of equipment which is to be used for handling liquids, moist gases or vapors, therefore, the possibility of galvanic corrosion should be given careful thought.

Such are the common causes of trouble. The cures for these troubles may be determined with the aid of Scovill's two other services:

Service in Men, which gives you the benefit, through consultation, of the many years' experience represented by Scovill engineers.

Service in Metals, which gives you complete laboratory and production facilities (as national needs permit) in the working-out of a solution to your problem.

For a further demonstration of *Service in Manuals*, of which the foregoing information is a sample, write us for Scovill's free "Condenser Tube Booklet", containing diagrams, formulae, description of alloys. Address Scovill Manufacturing Company, 24 Mill St., Waterbury, Conn.

THIS IS NUMBER TEN in a Series of Scovill Advertisements to help you get longer life from condenser and heat exchanger tubes.

Scovill
MANUFACTURING COMPANY
WATERBURY, CONN.

SCOVILL CONDENSER TUBES

ONE PRODUCT... THREE SERVICES

Service in Manuals... Service in Metals... Service in Men

★ NUMBER 8 IN A SERIES, TRACING FIFTEEN YEARS OF KELLETT AIRCRAFT HISTORY ★

Planning for Tomorrow

THE photograph above shows an earlier Kellett development, a military-type autogiro, undergoing tests by the Army Air Forces.

For many years, aeronautical engineers have strived to develop aircraft able to take off or land vertically on any kind of field or flat roof, and to climb handily over usual flight obstructions . . . aircraft that can cruise smoothly at satisfactory speeds, or hover motionless.

During the war, all available materials and manpower are required for military needs. But the growing Kellett engineering staff looks forward to peace, and the opportunity to focus its aeronautical design abilities on helicopter developments for a wide range of contributions to American progress.

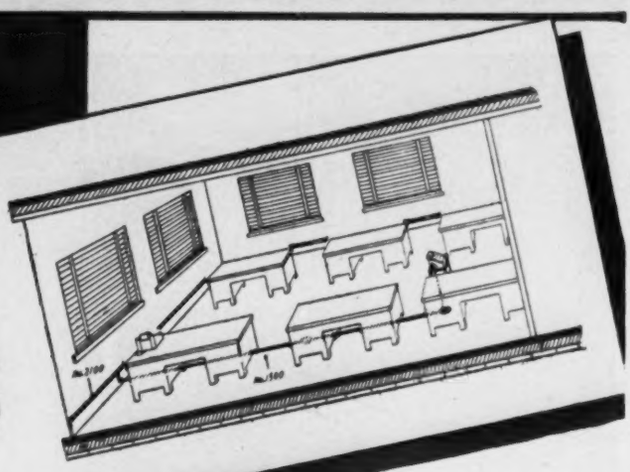
Indications are that modern aircraft of the helicopter type will then save time and money in forestry service, ranching, dusting and spraying agricultural crops, patrolling and inspecting cross-country power lines and oil pipe lines, in prospecting—and many more everyday services. Kellett Aircraft Corporation, Upper Darby (Philadelphia), Pennsylvania.

KELLETT

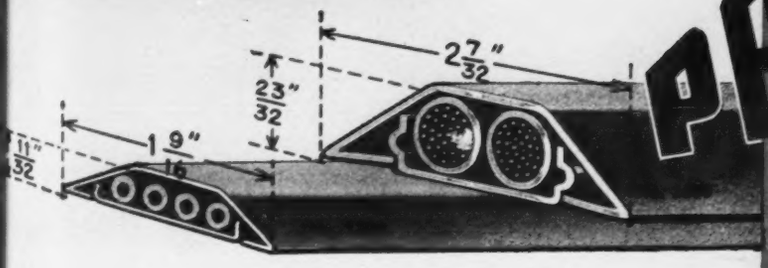
OLDEST ROTARY WING AIRCRAFT MANUFACTURING COMPANY

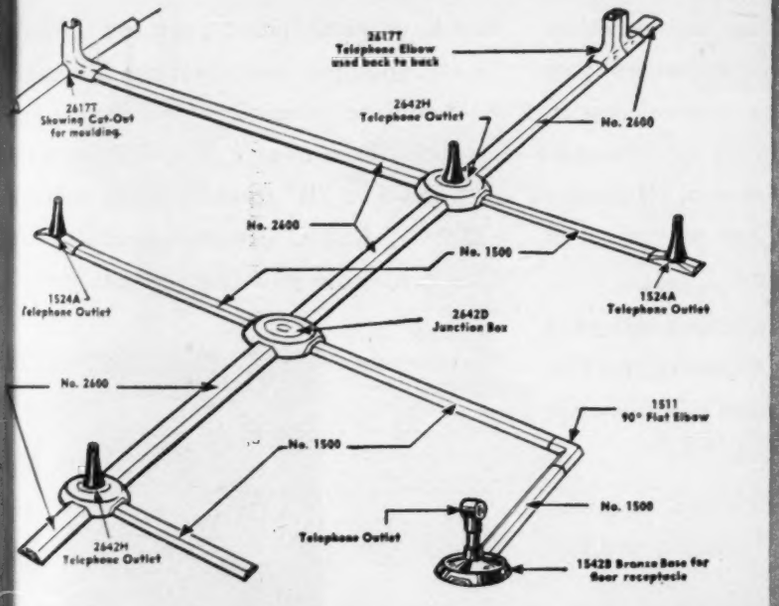
the problem

Telephone outlets to desks in factory + offices



the answer





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WIREMOLD

OVERFLOOR WIRING SYSTEMS

● Wiremold PANCAKE is the safe, simple, practical way to handle all those situations where telephone or light and power circuits must be brought to locations out in the middle of a floor area . . . where the necessary wiring is being laid out for desk installations in general offices, or where changes require relocation and extension of already installed wiring systems. No. 1500 PANCAKE is for general telephone or light and power service installations; No. 2600, with greater capacity, is especially designed for general office telephone system work. Write for new PANCAKE bulletins full of helpful suggestions.

CAPACITY:
No. 1500 4 No. 12 R. C. Conductors
No. 2600 Two 26-pair telephone cables.

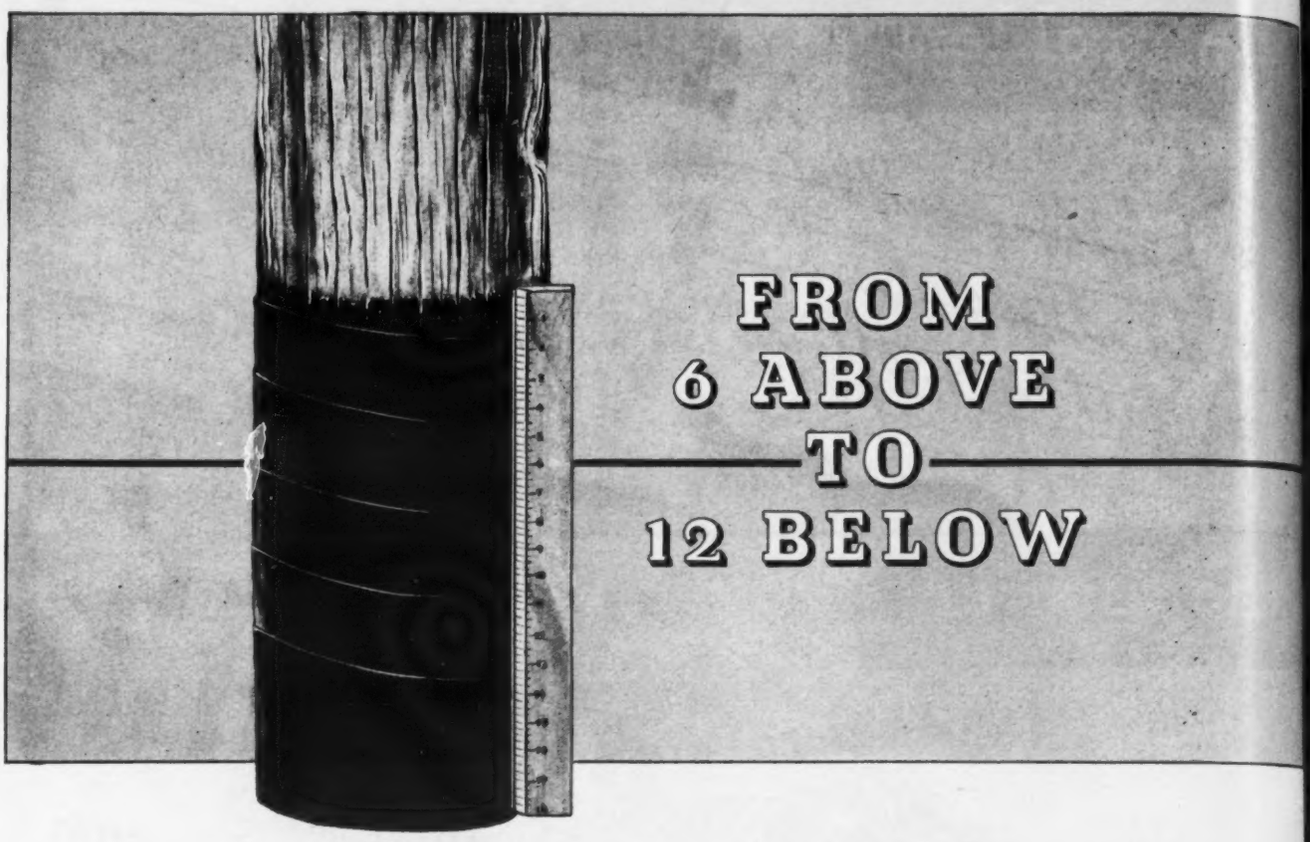
WIREMOLD CAN HELP YOU PRODUCE FOR WAR . . . WHILE YOU PLAN FOR PEACE!

KNOW YOUR

WIREMOLD

AND YOU KNOW THE ANSWERS

THE WIREMOLD COMPANY HARTFORD 10, CONN.

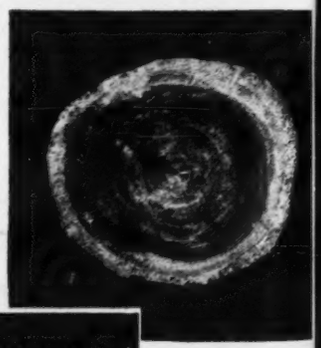


. . . that's where OSMOPLASTIC does its stuff

Groundline decay... more than any other factor... shortens the life expectancy of poles. It represents an annual loss to utility companies, running into the millions. Thus, in a lineal area of 18 inches ... from 6 above to 12 below... most of the pole damage is done.

Because this decay area is concentrated and easily accessible, OSMOPLASTIC treatment is ideally suited as a low-cost means of prolonging pole life.

The practical experience and maintenance records of many leading utilities that have established periodic groundline inspection and treating programs has resulted in greatly prolonging the service life of over 1,500,000 initially untreated or "B" treated poles through OSMOPLASTIC groundline treatment. Can we show you the factual proof?



The white outer area of this pole cross-section, cut at groundline, shows the deep penetrating action of the toxic chemicals in Osmoplastic.

MAKE INSPECTION TIME, PROTECTION TIME WITH

OSMOPLASTIC

MANUFACTURED BY

OSMOSE WOOD PRESERVING COMPANY OF AMERICA, INC.

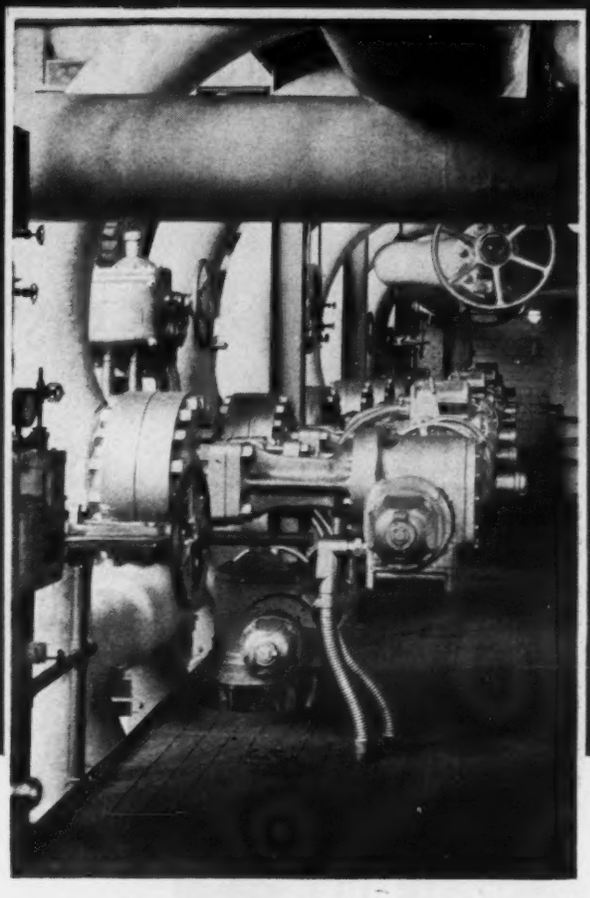
GENERAL OFFICES: BUFFALO 12, N. Y.

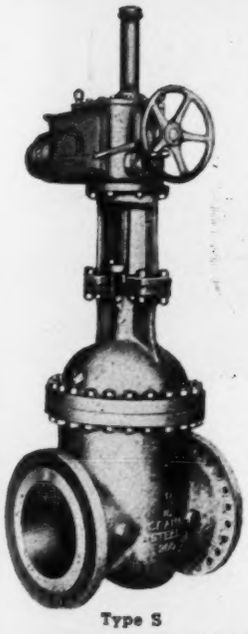
BRANCH AND SALES OFFICES: BIRMINGHAM 3, ALA.; DENVER 2, COLO.; NEW YORK 7, N. Y.; KENOVA, W. VA.; HARLAN, KY.; CHICAGO 4, ILL.

o Maintenance Problem Here

PHILADELPHIA LIMITORQUE VALVE CONTROLS

That LimiTorque Controls operate with practically no need for service or attention is a fact well known by the many Power Plants, Central Stations and Hydro-Electric Plants using them to open and close valves of all types and sizes. This dependability in service assures immediate and proper functioning every time, regardless of the operating conditions, temperatures or pressures.





Type S

Type M

LimiTorque Controls are made in many types, to fit all applications. Convenient push button stations can be installed close to the equipment and/or operation can be from a centrally located master control panel. This latter arrangement provides a constant and accurate knowledge of the status of all important valves throughout the plant at all times and allows the important operation of valve control to be handled easily, quickly and safely by responsible key workmen.

LimiTorque Controls are applicable to all types, and sizes of valves and can be adapted to existing equipment. Write us for more details.

Philadelphia

GEAR WORKS INCORPORATED

E AVE. AND G ST., PHILADELPHIA 34, PA. NEW YORK • PITTSBURGH • CHICAGO

Industrial Gears and Speed Reducers
LimiTorque Valve Controls

USED AS INDIVIDUAL UNITS ... USED

AS CONTINUOUS STRIP INSTALLATIONS

..... CEILING OR

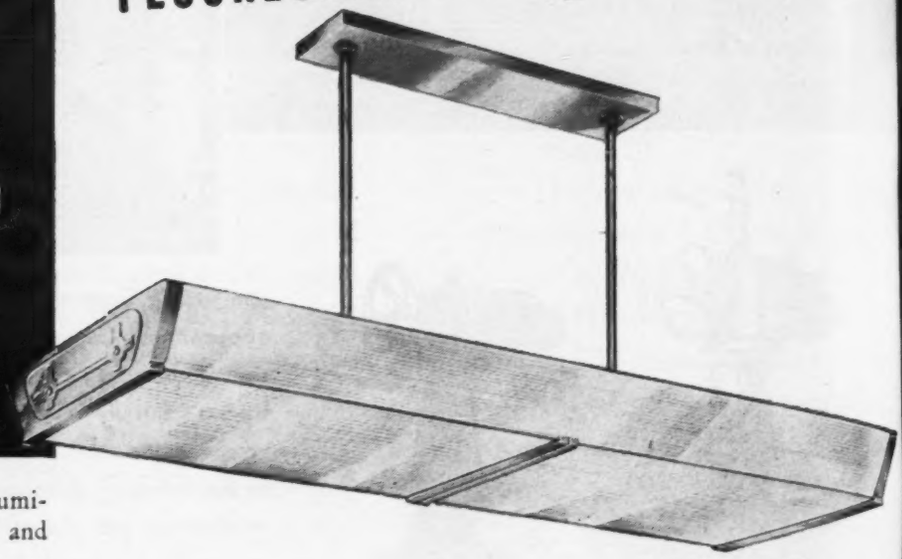
SUSPENSION MOUNTED

USING OR

FLUORESCENT LAMPS PER UNIT

WESTINGHOUSE COMMERCIAL FLUORESCENT LUMINARIES

PROVIDE THE LEVEL OF ILLUMINATION YOU NEED



Getting the correct level of illumination for good seeing in offices and drafting rooms is often a problem . . . especially when a variety of tasks are performed in one general section.

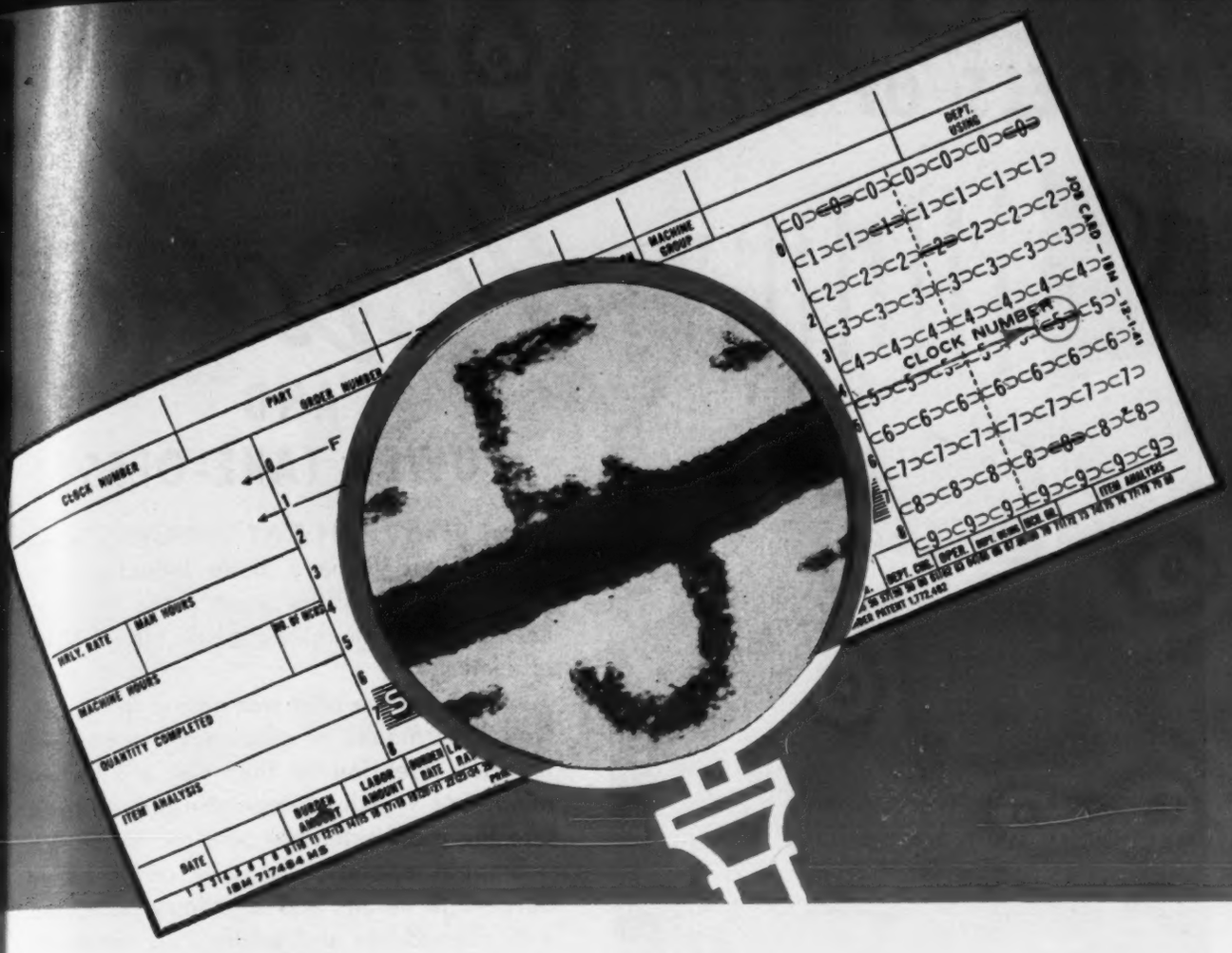
To simplify your ordering and installation Westinghouse now offers a complete new line of Commercial Fluorescent Luminaires to provide high level, glareless lighting over a wide range of intensities. Four attractive models, designed for either individual or continuous strip application . . . for suspension or ceiling mounting are available.

Ask your Westinghouse lighting distributor for full details or write for bulletin B-3332. Westinghouse Electric & Manufacturing Co., Dept. 7-N, East Pittsburgh, Pa. J-04001

Westinghouse

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

Lighting Equipment

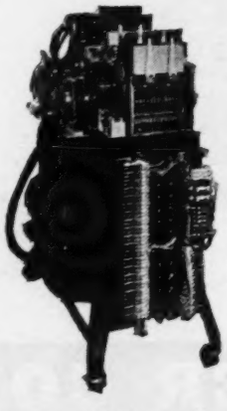


How an RCA Electron Tube can "sense" a pencil mark

THE enlarged section shown above is a photomicrograph of a pencil-line drawn through the printed figure "5" on an INTERNATIONAL BUSINESS MACHINES accounting machine card.

A pencil mark such as this, being composed of particles of graphite, can be made to function as a conductor of electricity. IBM has developed an ingenious electronic device in which this principle is used. Steel wire brushes, sweeping across the cards, pick up the tiny electric currents that are made to flow through the graphite pencil marks, and pass them along to a set of sensitive RCA electron tubes which amplify these very small currents so that they can be used to actuate the control relays of the card punching machine.

Compared to previous manual card punching operation, this electronic IBM "Mark Sensing Attachment" not only eliminates human errors at the key punch, but speeds up card preparation to a rate of 100 cards a minute.



International Business Machines "Mark Sensing Attachment" for IBM's Type 513 Automatic Reproducing Punch. Cover removed to show 20 RCA 25L6GT/G Beam power Amplifier tubes. On other side of machine are 10 more RCA tubes of the same type.

Probably right in your own plant, RCA electron tubes can perform some counting, sorting, control, measuring, or other function better, faster, more accurately, or more economically "the electronic way" than it is being done today. Why not write us so that we can refer you to the equipment manufacturer best fitted to solve your particular problem? Or our own tube engineers may be able to help you. *For the Magic Brain of all electronic equipment is a Tube... and the fountain-head of modern Tube development is RCA.*

Meantime, may we send you a free copy of "*Electrons in Action at RCA*," an illustrated, 32-page, practical booklet. Please write to RCA, Commercial Engineering Section, 629 South 5th Street, Harrison, New Jersey.

Buy More War Bonds

RCA

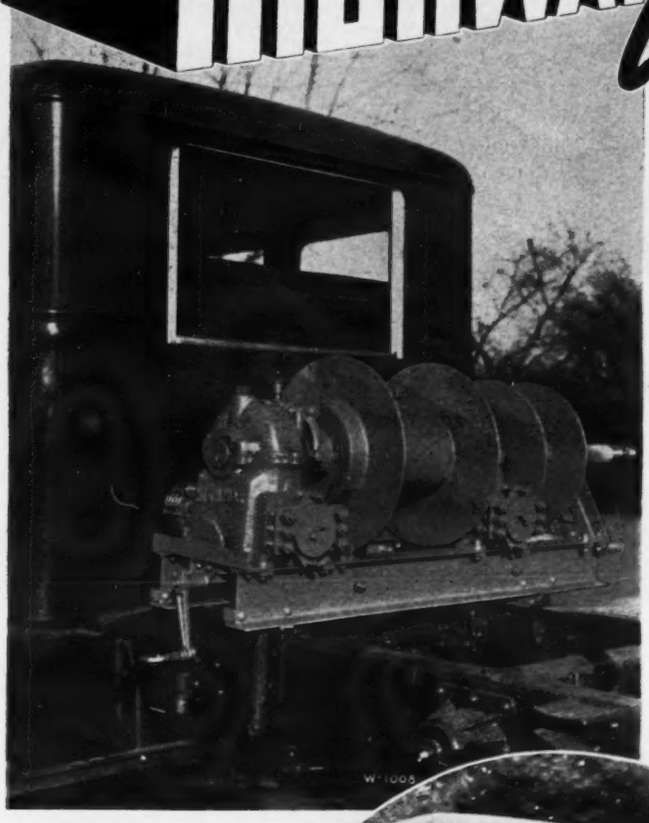
RADIO CORPORATION OF AMERICA

RCA VICTOR DIVISION · CAMDEN, N. J.

MODELS OF EFFICIENCY....

HIGHWAY *Winches*

AND POWER TAKE-OFFS



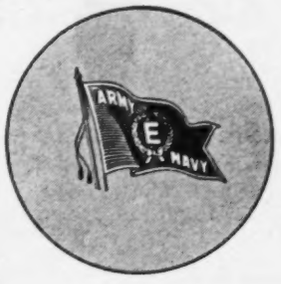
• For years HIGHWAY WINCHES in numerous models have been inducted into utility service and for years these Winches have served with characteristic HIGHWAY efficiency.

Now, with the post war period in the offing, these models of efficiency are brought to your attention so that you will be reminded of Winch equipment designed to fit into the most extensive construction work.

Smooth operation assured under heavy duty—lightweight and simplicity combined with ruggedness and safety . . . these are the factors that will contribute to your post war efficiency and economy.

ABOVE

HIGHWAY Model L-12c-6 Double Drum Winch. A dual purpose unit provided with a 12" drum having spline type clutch and with a 6" drum of the fixed type.



LEFT

HIGHWAY Model L-12c Winch. A small compact file drum type especially designed for installation on 1½ and 2 ton truck chassis.

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General Offices

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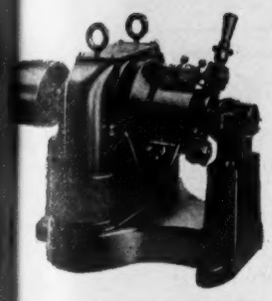
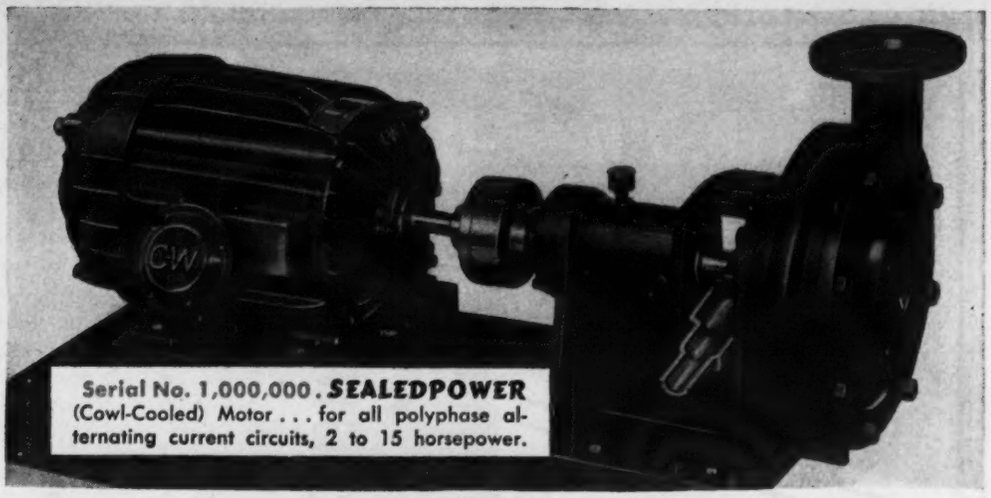
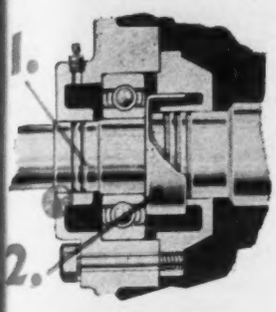


Serial No. 1 . . . Crocker-Wheeler Motor, built in 1888.



Serial No. 1,000,000. **SEALEDPOWER** (Cowl-Cooled) Motor . . . for all polyphase alternating current circuits, 2 to 15 horsepower.



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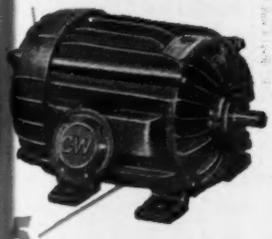

5.

SEALEDPOWER

Industry's Most Trouble-Free Motor

PRODUCED BY CROCKER-WHEELER'S 56 YEARS OF EXPERIENCE

CROCKER-WHEELER FEATURES:

1. Patented "Groovseal"—no greasing needed for at least a year. Grooves minimize grease loss. This seal makes bearing maintenance expense negligible. It permits use of softer grease, for better lubrication and longer bearing life. Airtight seal prevents dust or other foreign matter from entering bearings.

2. Crocker-Wheeler's exclusive De-Sludging Impeller. Automatically desludges . . . churns and distributes grease to bearings when motor is started.

3. Vacuum Impregnation—standard on *all* Crocker-Wheeler motors. Seals out foreign matter and moisture from each individual coil . . . fills all interstices, making windings a homogeneous mass . . . reduces hot-spot temperature and lengthens insulation life. Adherence of varnish prevents vibration of wires either inside or outside of slot. (Photograph shows cross sections of baseballs, (left) after vacuum impregnation and (right) before vacuum impregnation. Note penetration of varnish to center of tightly-wound ball, making it a moisture-proof, homogeneous mass.)

SEALEDPOWER FEATURES:

4. Totally Enclosed Cowl-Cooled Construction resists corrosion. Protects against acid or alkali fumes, splashing or dripping liquids, air-borne moisture, steam, corrosive gases, conducting dusts, metallic chips, etc.

5. Fin Type Construction for non-clog ventilation and easy cleaning.

WRITE FOR LITERATURE ON THE **SEALEDPOWER** MOTOR, WHICH IS WINNING THE PREFERENCE OF MACHINERY MANUFACTURERS AS WELL AS OF MOTOR USERS. OR CALL OUR NEAREST OFFICE.

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JOSHUA HENDY IRON WORKS

CROCKER-WHEELER DIVISION

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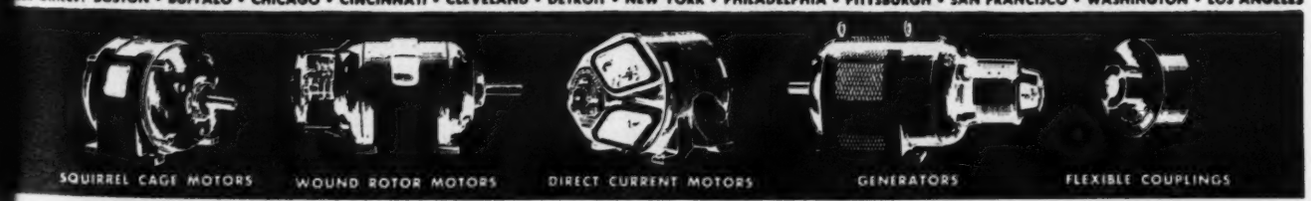
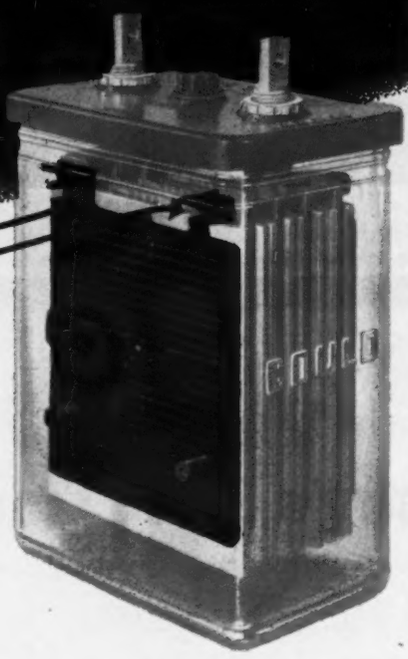


SQUIRREL CAGE MOTORS | WOUND ROTOR MOTORS | DIRECT CURRENT MOTORS | GENERATORS | FLEXIBLE COUPLINGS

PLANTÉ DUAL SUSPENSION

Eliminates PLATE DISTORTION

IN STATIONARY BATTERIES



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Rated Conservatively . . . Goulds equal or exceed in capacity any battery of comparable size and cell structure.

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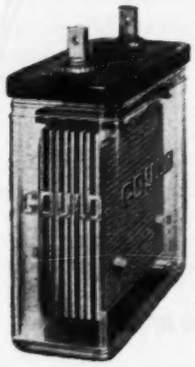
Are you receiving the monthly, informative "Gould Battery News"? If not, write for it.



• In the Planté, and other stationary batteries of the Gould line, a hook is built into the far sides of both positive and negative plates. These hooks fit into hard rubber channels which, in turn, are supported from the crossbar and plate assembly of opposite polarity.

This is the famous Gould Dual Suspension. Rigidly held at the top, there is no necessity for bottom supports. The plates hang freely in the electrolyte. "Growth" of the plates in normal battery operation does not press against the cover and terminal post assemblies. Thus any chance of misalignment or breakage of cell parts is completely eliminated and long battery life assured.

Get all the facts on the Gould Planté. Ask for the Gould Sealed-in-Glass Bulletin, using business letterhead.

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FOR EXCELLENCE IN STORAGE BATTERY PRODUCTION AT DEPEW PLANT

GOULD

Since 1898 THE BATTERY PICKED BY ENGINEERS

BATTERY VOLTAGE

One of a series of Gould service suggestio for users of industrial batteries

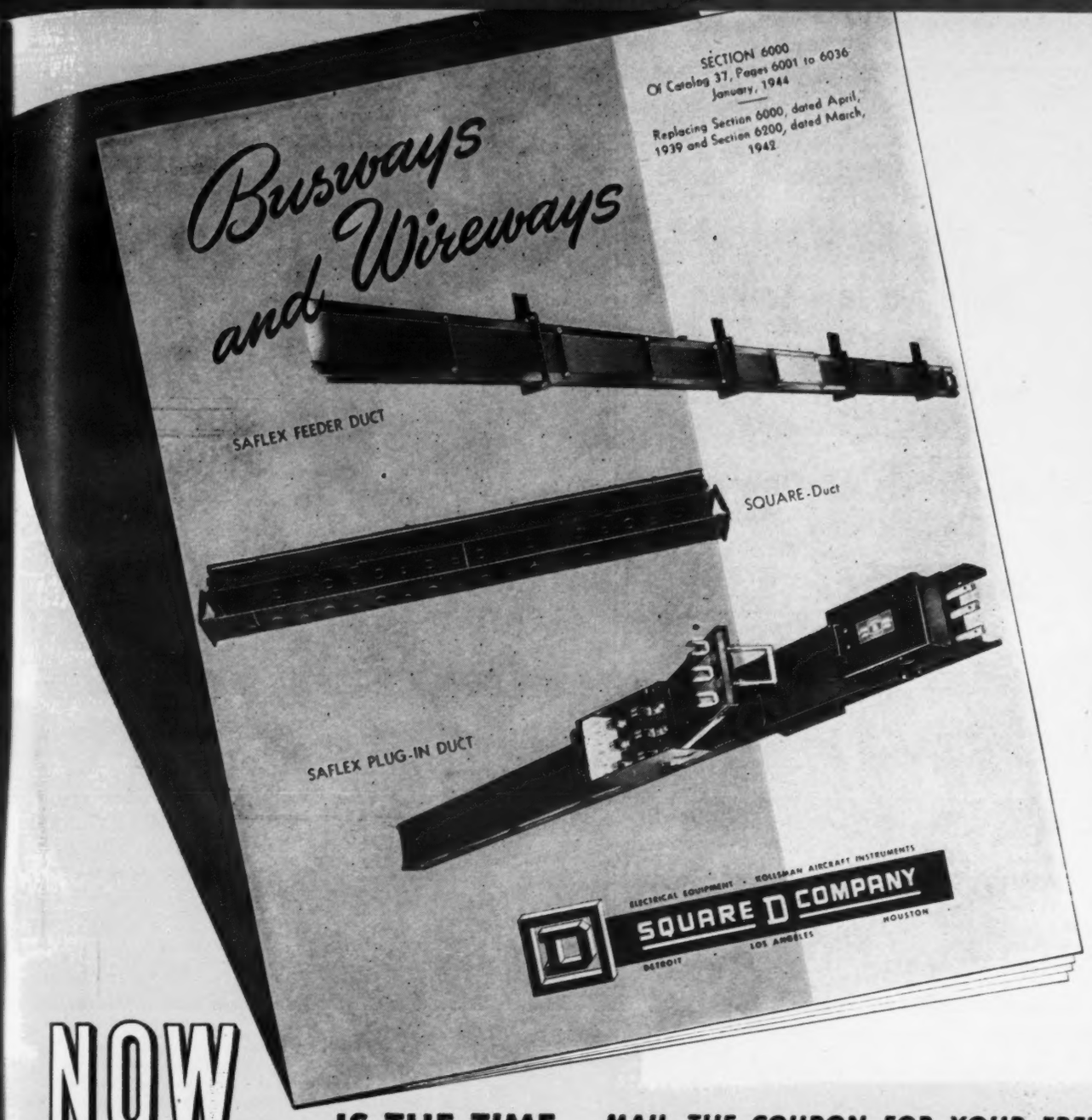
▶ The voltage of a fully charg lead-acid storage battery in go condition is around 2.1 volts. Th is true no matter how large or sm the cell may be. Multiples of 2 volts therefore determine the volta of your battery. If, for example, happens to contain 15 cells, its op circuit fully charged voltage is 31 volts.

The voltage of a cell on discharg is influenced by many factors. Amon these are: the cell's size, the state charge at the beginning of discharg the temperature of the battery an above all, the original design an present condition.

The normal operating range f cells in cycling service is from 2.0 to 1.75 volts. However, at the ver start of this discharge there is likel to be a slight drop in voltage that shortly followed by a correspondin rise. This is due to the fact that th action is at first confined to the su phuric acid contained in the pore of the plates.

Diffusion, or spreading, of th acid from the electrolyte to th plates is what keeps the battery dis charging and the voltage delivere by each cell is directly affected b this concentration of acid in an around the pores of the plates This operation is continuous bu as more and more acid is "used up" in the discharge operation the solu tion becomes weaker. There is gradual decrease in voltage unt the concentration of acid in th electrolyte is too weak to supply th needs of the plates. As a result th cell voltage drops below the opera tional point of around 1.75 volts and the battery is considered dis charged.

Temperature also affects the volt age characteristics of a lead-cel battery. In cold weather acid in creases in viscosity and thus th speed of chemical reaction is pro portional to the temperature. This affects the ampere hour capacity and, therefore, a battery operatin in a cold climate will not have th same operating hours as one work ing under more temperate condi tions. *(Advertisement)*


SECTION 6000
Of Catalog 37, Pages 6001 to 6036
January, 1944
Replacing Section 6000, dated April, 1939 and Section 6200, dated March, 1942
Busways and Wireways
SAFLEX FEEDER DUCT
SQUARE-Duct
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ELECTRICAL EQUIPMENT • KOLLSMAN AIRCRAFT INSTRUMENTS
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In the face of today's manpower shortage, peak efficiency of electrical distribution systems is vital. It will be equally important in the highly competitive and narrow-margin years ahead.

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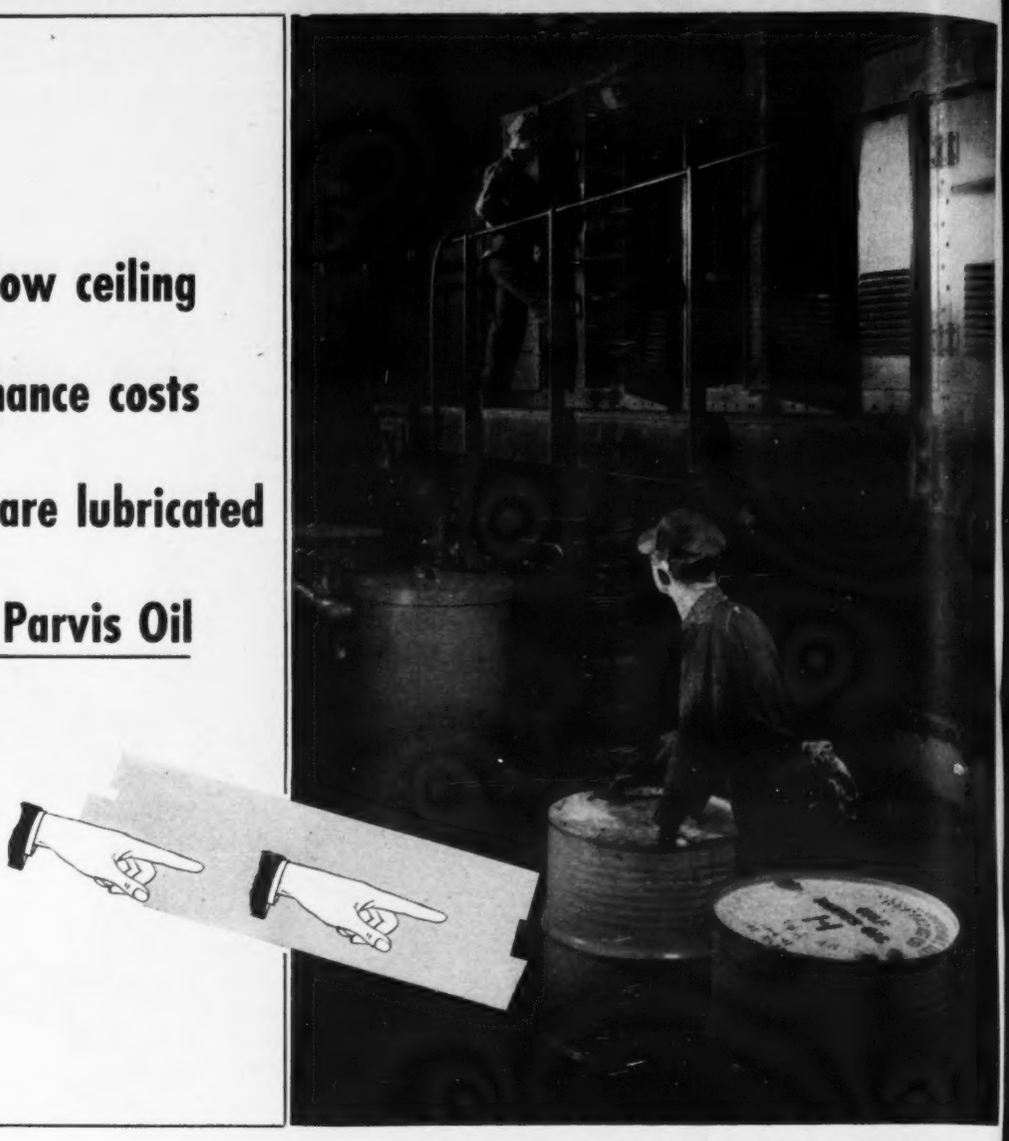
There's a low ceiling on maintenance costs when Diesels are lubricated with Gulf Parvis Oil



With Gulf Parvis Oil, a prominent railroad cut maintenance costs of Diesel switching locomotives 18%, and increased availability 8%. The photo above shows one of these units being serviced with fuel and lubricating oil.

Maintenance costs usually tell the story of lubrication efficiency — and Diesel maintenance costs hit new lows with Gulf Parvis Oil in service.

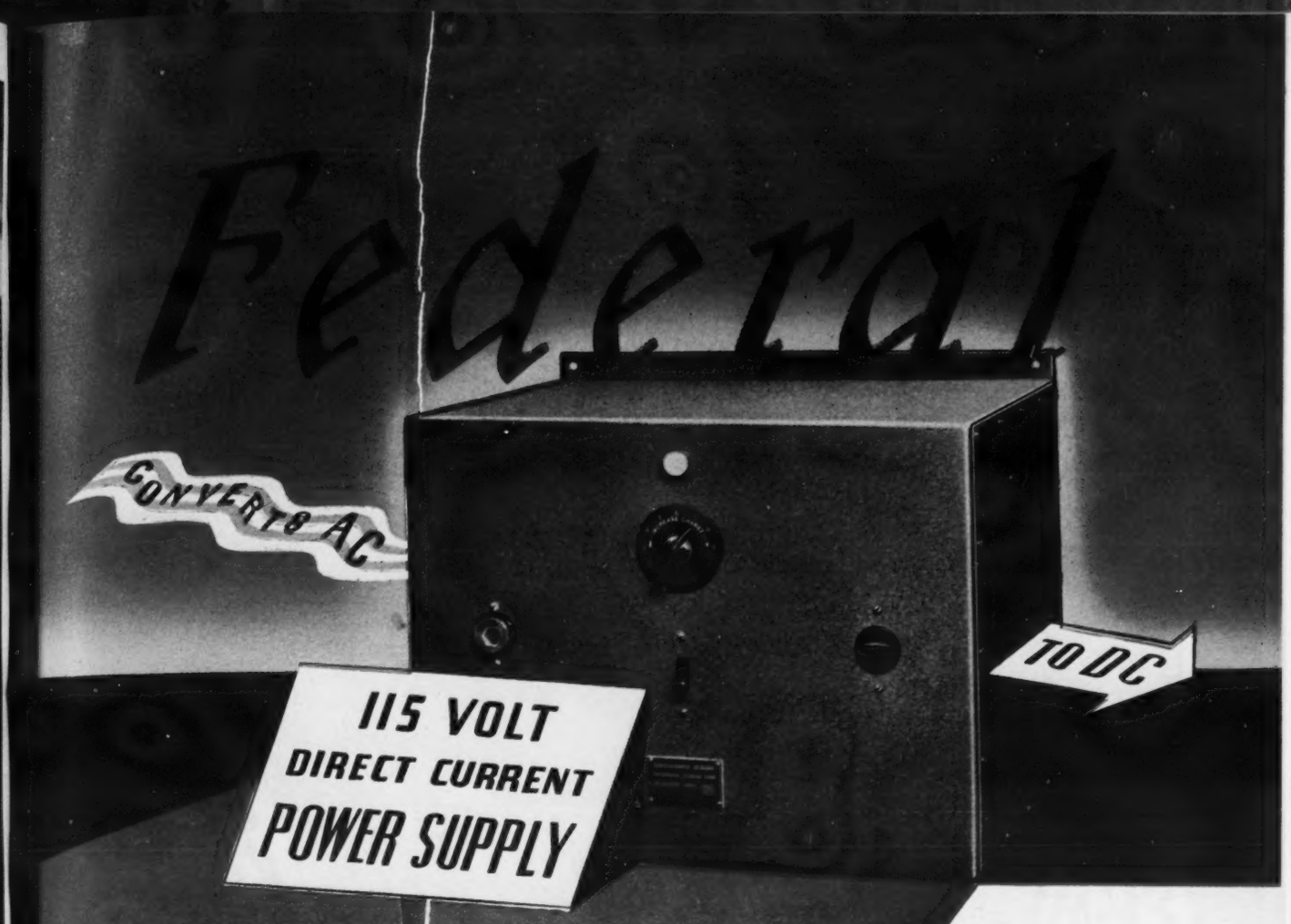
Especially manufactured for improved lubrication of Diesel engines, Gulf Parvis Oil provides greater protection for cylinders, pistons, bearings, and other hard-to-replace parts under today's peak-load and over-load operating conditions. Gulf Parvis Oil offers you *proven performance and long life!*

For better lubrication of your Diesels, call in a Gulf Service Engineer and ask him to recommend the proper type and grade of Gulf Parvis Oil to fit your particular requirements. His thorough training and broad experience with all types of Diesel engines is your assurance of sound and helpful recommendations. Write, wire, or phone your nearest Gulf office today.

GULF INDUSTRIAL LUBRICATION

BACK THE ATTACK...
BUY MORE WAR BONDS!

GULF OIL CORPORATION · GULF REFINING COMPANY · GULF BUILDING, PITTSBURGH 30, PA.



FEDERAL POWER EQUIPMENT—well known for long dependable life, low cost, and high efficiency . . . made in a wide range of sizes and outputs . . . for any DC need from any AC source.

- **PUBLIC UTILITIES**—for station DC bus service, floating storage batteries and operating controls.
- **CHEMICAL AND METALLURGICAL**—DC power for refining, electroplating, electro-cleaning and laboratory analysis.
- **METALWORKING**—for operating magnetic equipment such as grinders, chucks, lifts and vibrating hammers.
- **FOOD AND DRUGS**—for magnetic separators, operating packaging equipment and power supply for processing.
- **INDUSTRIAL PLANTS**—for DC motor operation, electric brakes, general testing and generator field excitation.

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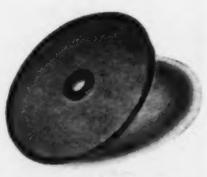


Federal's exclusive CENTER CONTACT Selenium Rectifier discs provide new protection against corrosive atmosphere, are now in Federal Power Supply equipment. FIRST IN THE FIELD . . . . STANDARD FOR INDUSTRY. *Write for Bulletins.*

Federal Telephone and Radio Corporation

A unit of IT&T

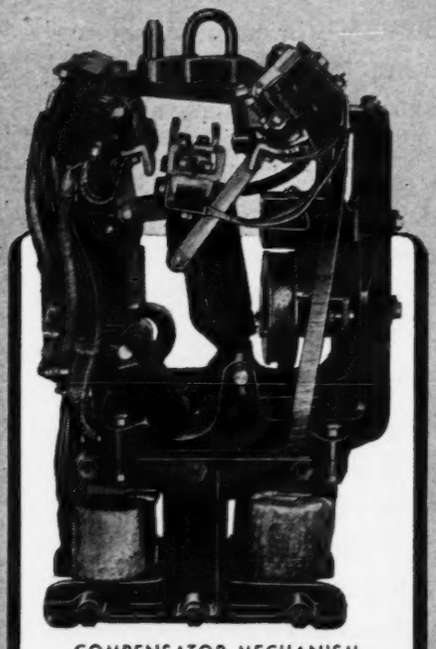
Newark 1, N. J.

One of several pumping stations using many EC&M Starters, supplying water to a large northeastern war plant.

REDUCED VOLTAGE Motor Starters

SERVE OUTDOOR PUMPING STATION....

No Control Room Needed



COMPENSATOR MECHANISM

Single, quick-break, double-throw Contactor operated by a *single* magnet. Quick transfer from reduced voltage starting to full voltage running by a throw-over spring and a mechanical latch tripped by a current limit relay.

DAY in and day out, in the freezing winter, in the sizzling summer heat and the torrential rains—under all weather conditions—these EC&M Starters operate successfully.

They are simple, completely wired units, totally enclosed and oil-immersed in steel tanks.

Total oil-immersion of the compensator-mechanism not only permits interrupting the circuit under oil (recognized as an effective means for breaking alternating currents), but also provides continuous lubrication for all operating parts of the mechanism and protects them from dust, moisture and corrosion.

Wherever moisture, corrosion and dust must be combated, these EC&M Starters provide fool-proof, dependable operation. *Ask for Bulletin 1045-B.*

THE ELECTRIC CONTROLLER & MFG. CO.

2700 E. 79th ST. ★ CLEVELAND 4, OHIO

MORE POWER TO YOU

Through Anaconda Copper Bus Conductors

COPPER HAS ALWAYS been the most widely used material for bus conductors. In addition to the basic requirement of high conductivity and consequent low current losses, copper provides high thermal conductivity, high strength and high resistance to corrosion. Accessory equipment is readily available.

And Anaconda Copper Bus Conductors are available in shapes to meet every power transmission requirement:

Flat Bars, requiring minimum space, may be bent or twisted, connected to apparatus without special joint preparation, and in laminated construction have unlimited d.c. capacity.

Tubes provide the highest bus conductor efficiency at a.c. frequencies, have greater rigidity, less surface area for dissipation of heat and may be oil or water cooled.

Channels, with large surface area and ventilation feature reduce temperature rise, have greater rigidity for long runs than tubes, flat surfaces for tap-off.

Angle Squares, ventilated hollow busses with highest rate of heat dissipation handle greater current density but require more space for installation.

Cables solve many problems in conducting extremely heavy currents in confined space or in connecting moving apparatus such as arc or resistance furnaces.

Information, including our Bus Conductor Booklet C-25, and the advice of our Technical Department on various bus conductors and assemblies, is available on request. 44110

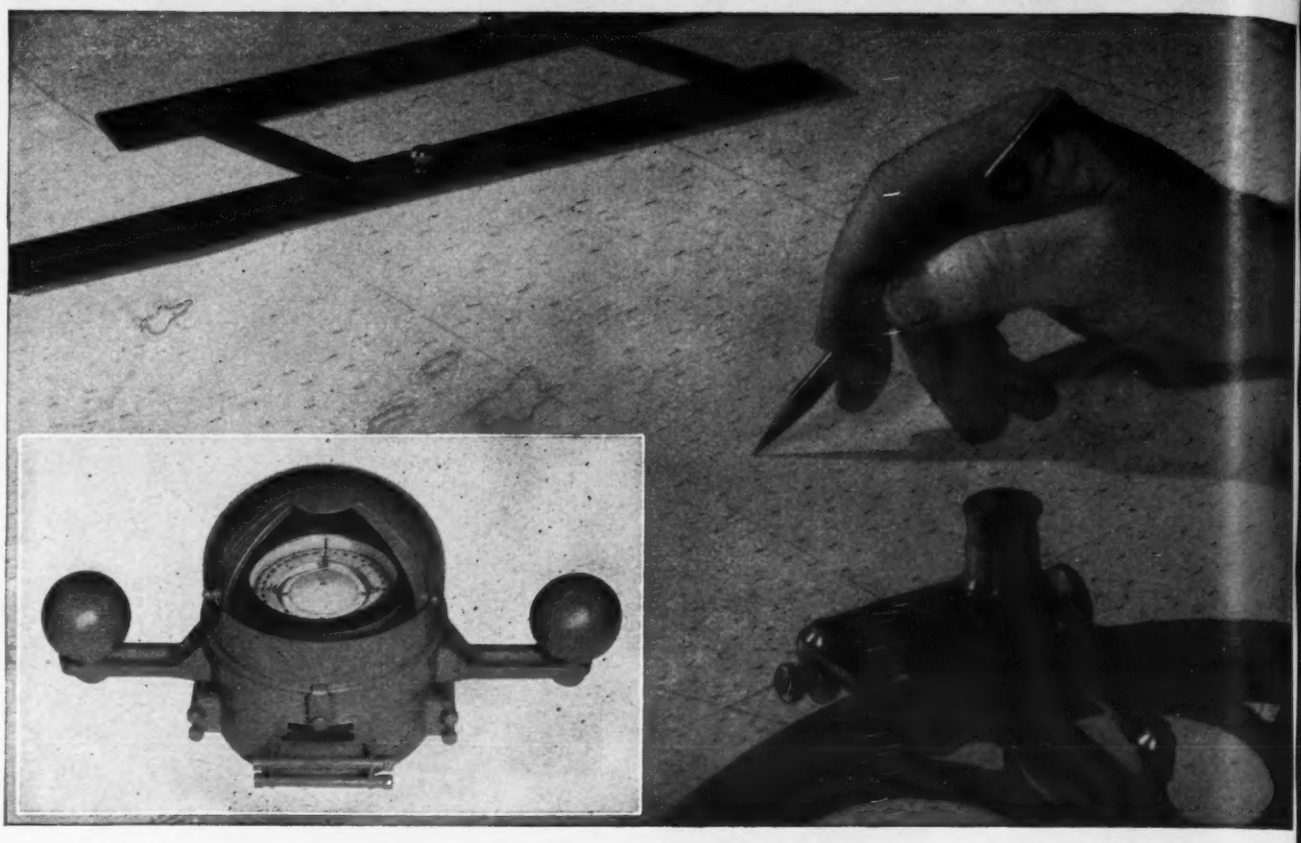
ANACONDA

Anaconda Copper

THE AMERICAN BRASS COMPANY—General Offices: Waterbury 88, Connecticut

Subsidiary of Anaconda Copper Mining Company—In Canada: ANACONDA AMERICAN BRASS LTD., *New Toronto, Ont.*

PERMANENT MAGNETS MAY DO IT BETTER



Rendezvous on a "Fly-Speck"

A PRECISION instrument used for guiding both large and small ships to their destinations is the magnetic compass, such as the one illustrated above. Unprecedented quantities are required for marine service. Many magnetic compasses are also used in planes and tanks.

Modern compasses are versions of the earliest known application of permanent magnets. Today the hundreds of uses for permanent magnets are widely diversified and are expanding rapidly through aggressive engineering and research.

34 years of specialized experience in this field have enabled us to play a leading role in developing these new uses. Our large, modern plant is one of the nation's vital sources of supply.

Write us, on your letterhead, for the address of our office nearest you and a copy of our "Permanent Magnet Manual" containing valuable data.

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●

The booklet about these turbines will give you very interesting factual evidence and data. It is valuable to have on file, even though you may not immediately need turbines. Write for a copy.

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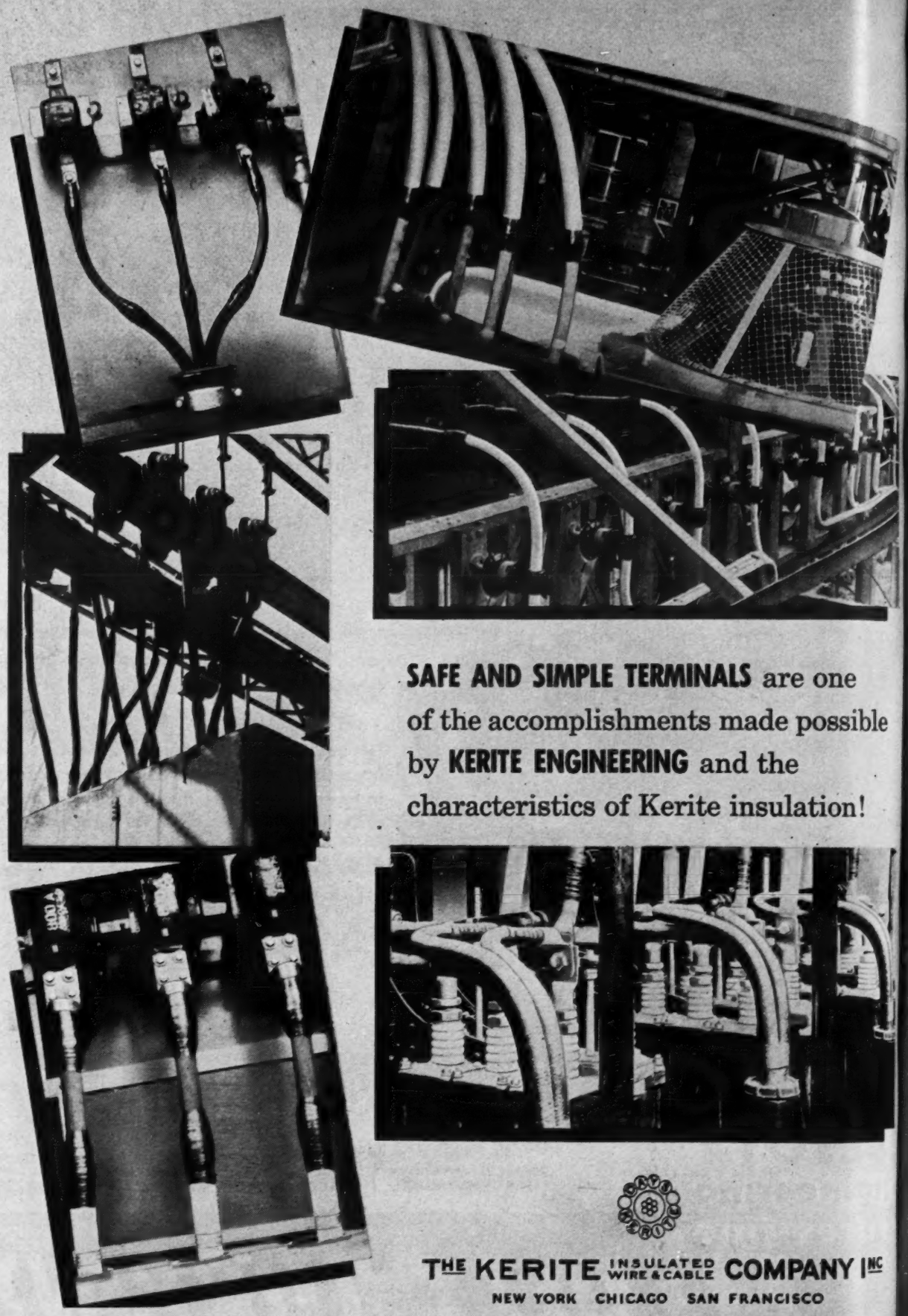

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NEW YORK CHICAGO SAN FRANCISCO

Electrical World

MAY 27, 1944

Disunity and Fear

IN ALMOST any gathering of electric utility men agreement can be had that the industry has too many associations, yet there are certain very important jobs to be done that can't be done without setting up some additional associations. Beyond that the area of agreement narrows sharply and uncompromisingly.

Is the utility industry going to create a new association every time a new problem arises and thus further exhibit its distressing lack of unity? Does not the industry understand that uncompromising divergence on policy is the very thing that keeps it weak?

There is a definite need for an overall organization representative of the four major branches of the entire electrical industry. Other great industries have thus coordinated their activities as they relate to the public and they are effective. How can such an organization be created in this industry and made to operate when one of the principal units cannot agree on what it wants and what it will do?

There is a pressing need today for unified presentation of the utilities' case in Washington, both defensively and offensively. There is no way it can be done under the present set-up of either the Council of Electric Operating Companies or the Edison Electric Institute. And if a way were found it would be difficult to do anything because of lack of unity as to what should be done, how far to go, what approach to take.

The industry advertising program which is attracting new contributors and generally meeting with the approval of those who are putting up the money, after two and a half years still lacks a sponsor. General agreement will be found that anonymity is not good for the program, but despite the fact that its contributors form the major part of the membership of the other organizations no home can be found for it.

And, finally, there is need for a program of employee education, a need just as strong as that for public education and which a great many companies have recognized to the extent of starting their own program. There is no place today where that can be done and, if there were, it would be difficult to accomplish, again because of the lack of unity.

That everybody cannot agree on all matters of policy and practice isn't what is perplexing, merely the fact that, having thrashed out their differences and a substantial majority having expressed a preference, the rest can't all leave their marbles in the game.

If the utility industry has any thoughts of emulating the railroad industry or any other great industry that is presenting a strong front, it must get rid of uncompromising individualism and shed its fear complex.

Disunity and fear are the industry's two greatest weaknesses today. Give them time and they will destroy the industry.

Post-War Opportunities for Power People

A brief resumé of trends in system and in customer application equipment to answer the returning service man who questions the attractiveness of the future of the electric power business

TOM FORT, Westinghouse Electric & Manufacturing Co., East Pittsburgh, Penn.*

SOME WEEKS ago a young man on war service leave from our department, when back home for a visit made this rather startling statement: "When I return from the war why should I go back in the power end of the electrical business? I want to get into something with more future."

My surprise probably caused my reply to be not fully convincing. But here is a question which will have to be answered countless times by those of us who are in the power end of the electrical business. Similar questions will be asked by people on wartime leave, and by those in our industry who are sought by other industries.

Today, I am ready to talk to that young man when he comes back from the South Pacific or wherever else he may have seen service. I think he can be convinced that the electric power business has opportunities unequaled by almost any field in the post-war period. These opportunities will exist because of greater needs for electric power. These needs are the key to the future of all branches of the electric power business.

Lighting

The electrical industry's first job was to provide light, and after more than 50 years of existence this is still its most important assignment, and will be as far as we can see into the future. The magnitude of our post-war lighting job is almost beyond comprehension. The many people who have worked in new well lighted war plants will want something better than most pre-war lighting. There are more than 100,000 factories in this country that need better lighting to be competitive in post-war manufacturing operations. Almost a million offices are in need of adequate lighting. One million two-hundred-thousand stores need lighting modernization. What is perhaps most important is the fact that there are more than 200,000 schools in this country still trying to use modern teaching methods under antiquated seeing conditions, probably permanently affecting the eyes of the coming generation.

Electric Heat

The war has stimulated the development of many new applications in the electric heating field. Virtually every industry will have a need for some of the new ways electric heat can be used in processing and manufacturing.

The electric heat treating furnace is an example of how this field has expanded. Recent developments make it possible to introduce special gas atmospheres into such a furnace. These gases can be in equilibrium with steel of any carbon content and prevent decarburization during heat treatment. This provides industry with an almost perfect method for bright hardening, bright annealing, and bright tempering of metal products. Think of what the elimination of the scale problem in many fields of heat treating will mean. It will open up many applications for electric heat treating.

Opportunities for the electric arc furnace have been vastly increased. Many communities can now have small steel plants concentrating on special steels which are locally needed and made out of local scrap. Thus, the electric arc furnace may give some degree of national spread to an industry which is now concentrated in relatively few areas.

Electronics

The other day I visited a forge shop. Much to my surprise the place was spotlessly clean. There was no visual evidence of heat or flame. Electric induction heating was used to heat the forgings. By merely slipping the forge blank into a helix excited from a high frequency generator, the blank was brought to the correct temperature for forging or pressing into shape. This is only typical of many ways in which this new art will revolutionize many heat-treating fields. It is enabling industry to manufacture tin plate with about one-third the tin used before the war; surface harden gears at about half the previous cost; perform what were heretofore considered impossible soldering and brazing operations.

In the dielectric field the application of high frequency heating to replace steam in presses has reduced the time for curing comparable thicknesses of plywood from one and one-half hours to seven minutes. In the manufacture of boxes, glue can be made to dry almost instantly with dielectric heating. In the manufacture of plastics, dielectric heating can frequently do the job in one-fifth the time previously required. Here is literally a large branch of the electrical industry created entirely in the past few years. Its demand for oscillators and similar radio type equipment may even be greater than the requirements of the radio field itself.

* Manager Central Station Department

In still another field the electrical engineers have given us a new tool with which to probe for new uses for electric power-resistance welding. Before the war this type of welding was used almost exclusively in the automobile and other quantity production industries. Today, industry generally is beginning to realize that here is a method which will enable it to handle thin metal sheets much like a dressmaker handles cloth. Before long almost every plant with a metal working problem will have applications for electric welding. Neither will they be limited to thin sheets. Today in our shops we are putting together steel plates over three-quarters of an inch thick with resistance welding. This presents great possibilities in building structural parts of machines as normalizing is not necessary after the resistance welding operation is complete.

Home Possibilities

In the home there are many new possibilities. The automatic washing machine, the electric dryer, electric ironer, and electric hot water heater provide a unit combination for the home laundry which will make present home laundries as obsolete as the wash tub and scrub board. The refrigerator with a deep freeze attachment may become a common thing in the home. Developments in the pressure cooking of food may make it possible to cook a complete meal right on the table in a few minutes.

One does not have to carry this story very far to be convinced that there was never a time when electric power had so many jobs to do and so many new ways of doing them. For those primarily interested in generating stations, distribution systems and transmission systems, there is a similar range of opportunities for new methods.

The war has accelerated metallurgical development so that new metals make possible radical advances in the field of generation. Temperature limits for the steam cycle will be raised. These metals will make the gas turbine a commercial product.

New schemes for applying series capacitors make it possible to increase the capacity of certain transmission lines by 50 percent. Improvements in electronic tubes may make direct current transmission a practicability.

New loads are going to be located in different places from existing loads. Distribution systems must be revamped to take care of them. If the

Tom Fort

average residential consumption of power is doubled, consideration may have to be given to the use of higher primary voltages for distribution systems. Many new schemes and devices for improved distribution are in the offing.

Much of the job of rehabilitating electric installations in war areas will fall to American industry. We are already building power plants which will float; others which can be drawn by locomotives like a train, and still others which are being made up of such small pieces they can be hauled over mountains on mule-back for assembly in remote parts of the world.

All in all, the man who is interested in the use, application, design, or selling of equipment to supply power has ample reason to feel he is in a business of great future possibilities.

However, it is not a business without its serious problems. In the manufacturing end we find greatly expanded plants due to the war effort. The utility companies have systems which were enlarged for handling special war loads. We are faced with re-negotiation, with contract termination, high taxes, labor problems, excess regulation, the fear of government competition, and goodness knows what else. We have such a big list of troubles that they may have obscured our opportunities.

Challenge of the Future

These troubles are challenges not only for us, but for the young men who will come into our industry after the war. We can't believe that these men who have challenged shells and bullets will feel afraid to face any problems business will present when they return. In fact, their experience may make them less afraid of some of the hazards of the electric power business and give them a clearer vision of the future possibilities than we who are at home may have.

If there is to be any really great challenge to the future of electric power, it will result from our failure to realize and provide the opportunities for young men and stimulate the efforts of our present loyal workers. With the many new jobs for electric power to do and the continuous technical developments of new and better ways to do the job, we must push aside our handicaps and give young men who want to work and those returning from wartime leaves, a true insight into the great possibilities of our business.

So be ready to answer the question: "What future is there in the electric power business?" If we present the facts as to the future of our industry to those who ask this question there is little doubt that they will recognize that the power end of the industry has great possibilities.

WASTE PAPER IS NOT WASTED

When It Is Salvaged to Pack the Ammunition for the Soldier Who Packs the Gun

Service Program Clicks with Georgia Power Customers

Summary of results proves value of efforts to keep appliances working and to hold customers' good will—Customer service staff organized—Program will be continued after war

W. B. FARNSWORTH, Manager, Customer Service Division, Georgia Power Co.

WITH THE MANUFACTURE of major and small electric appliances pushed aside to make way for vital war production, what should the Georgia Power Company do for its 221,613 residential customers to help make their electric appliances last for the duration?

That question posed quite a problem in January, 1943, for the management of this widespread southern electric utility. If appliances broke down, the company stood to lose not only the electrical load but the goodwill of its customers. How could these assets be retained?

Personnel Available

The answer was close at hand, for the members of the utility's merchandise sales staff were veterans in the care and use of electric appliances, large and small. The thing to do was to make customer service representatives of these salesmen and women and use them in an intensive program to help customers make the most of their electric equipment and service during the war.

The purpose and scope of this program have already been described (ELECTRICAL WORLD, August 21, 1943, page 106), but to account for its first year of operation they must briefly be given again. The three-fold objective of the program is (1) to help each electric customer make the most satisfactory use of his electric service and equipment, (2) to keep him on the list of satisfied customers by discovering and removing any causes of dissatisfaction, and (3) to win and maintain his goodwill for the company.

In establishing these purposes, we were mindful, as all alert business firms must be, that "the customer's memory is longer than the war." We intended to permit no attitude of indifference or neglect of our customers to slip in, even though the war had curtailed many of our pre-war customer services.

A new customer service staff—to expand the services to our customers beyond those provided by our home service staff—was set up. It consisted of 60 people, mostly former merchandise salespeople. In January 1943, they were trained in intensive courses and the company's 5,000 employees were acquainted with the program through distribution of a booklet entitled "Our New Customer Service Program, Its Aims, Methods, and Benefits."

The representatives were charged with these duties when they called at customers' homes: (1) Inspect all appliances. (2) Suggest correct ways of appliance use and care. (3) Make minor repairs. (4) Bring in small appliances for repair. (5) Take orders for major appliance repairs. (6) Teach replacement of circuit fuses. (7) Follow through on barter and trade of customers' appliances. (8) Help salvage critical materials. (9) Handle complaints to customer's satisfaction. (10) Act as *customer's* employee on company payroll.

To do all these jobs, the customer service men and women were provided practical reference literature to

Results from Home Service Representative Program

Activity	February 1943	December 1943	Total 1943	February 1944	2 Months 1944	Total 13 Months
HOME INTERVIEWS:						
Number of Interviews	4,103	4,937	58,601	5,428	10,491	69,092
Appliance Instructions Given	3,280	7,113	81,785	9,001	17,147	98,932
Repairs Made	1,525	2,542	30,793	2,613	5,360	36,153
Repair Orders Made	283	215	3,464	204	445	3,909
Appliances Brought for Repair	353	278	3,571	278	557	4,128
Repairs Referred to Dealers	65	348	2,991	435	762	3,753
Complaints Received	140	19	515	30	74	589
Complaints Completed	*	20	*	29	66	.....
Fuse Renewal Instructions	2,568	3,251	40,516	3,426	6,627	47,143
Appliances Listed: To Buy	304	522	5,565	703	1,326	6,891
Appliances Listed: To Sell	113	93	1,057	90	193	1,250
Appliances Listed: Sold	†	153	†	89	163	.....
FLOOR INTERVIEWS:						
Number of Interviews	.....	4,526	28,524	5,027	8,892	37,416
Appliance Instructions Given	.....	865	7,959	1,438	3,105	11,064
Repairs Made	.....	626	3,870	703	1,367	5,237
Repair Orders Made	.....	59	1,282	100	211	1,493
Complaints Received	.....	1	39	6	10	49
Complaints Completed	.....	0	*	6	10	.....
Fuse Renewal Instructions	.....	121	2,319	142	279	2,598
Appliances Listed: To Buy	.....	189	2,353	367	633	2,986
Appliances Listed: To Sell	.....	162	1,039	169	325	1,364
Appliances Listed: Sold	.....	149	†	199	350	.....
Repairs Brought by Customers	.....	1,402	7,029	1,592	3,012	10,041
Repairs Referred to Dealers	.....	336	3,513	377	741	4,254
Total Operations		9,463	87,125	32,452	62,146	149,271
†Appliances Sold for Customers, Floor and Home Contracts	.....	2,904				

*This record started in September, 1943.

dy, and lay literature for distribution to customers on appliance care and use, nutrition, wiring, and lighting problems.

The services offered by these new representatives were publicized through newspaper advertising and store displays. To conserve transportation, they went from house to house as many of them did in peacetime as appliance salesmen. As a result of one man's suggestion, a "regrets" calling card was printed and left where nobody was home. This card invited a call for any assistance the customer service representative might render. It was left with an "appliance care and use" booklet.

They'll help you SAVE ELECTRICITY
and make your Appliances last longer
Conservation is the business of our 102 Service Representatives
HELP AT YOUR STORE, OFFICE OR PLANT, TOO!

CUSTOMER service program is backed up by consistent newspaper advertising

Results Obtained

What have been the results of this customer service program? Well, during the first 13 months of its operation—from February 1, 1943, through February, 1944—a total of 69,092 customers were interviewed in their homes and 37,416 more were interviewed in company offices. These customers were given 98,932 appliance use instructions in their homes, and 11,064 in the offices.

Appliance repairs totaling 36,153 were made in the homes, and 5,237 were made in the offices. All these were made without charge except for necessary cord or parts, and they consisted mostly of cord and percolator repairs. In addition, 4,128 small appliances were brought in from homes to be repaired, and repair orders were made for 3,909 appliances in the homes. Floor representatives took 3,649 repair orders for appliances in homes.

Dealers Profited

Also, during the 13-month period, representatives to homes referred 3,753 repairs to dealers, and floor representatives referred another 4,254. All this was in keeping with the company's policy on servicing appliances. This goodwill building policy reads: "The Georgia Power Company will continue to repair and service all appliances sold by it, but it prefers that customers give their repair business on appliances to the dealers from whom they purchased such appliances or to their successors. When a customer cannot secure service on an appliance purchased from other dealers this company will service the appliance (radio excepted) for the customer as quickly as possible."

Both home and floor customer service personnel received 638 complaints and cleared them up directly or through other departments. The joint staff gave fuse renewal instructions to 49,741 customers.

Barter and Exchange

Operation of an appliance information exchange service for the barter and trade of appliances by customers was very popular. During the 13 months, customers listed with the representatives 9,877 appliances they wanted to buy. Other customers reported 2,614 appliances they wanted to sell. The sale of 2,904 appliances was effected in the six months from September, 1943. (The difference in the "for sale" and "sold" figures is due to many appliances being sold before they were listed—seller and prospect were put in touch with each other before any record had been made of the appliance being available for sale.)

Refrigerator Users

To keep refrigerator users satisfied, the company used its limited allotment of new electric refrigerators in two ways. Some were provided to customers at a small service charge, while their broken refrigerators were being repaired. Other new boxes were sold only to customers whose old electric refrigerators had been broken down beyond repair. This policy made it easier for the appliance repair staff to do its heavier job of repair and maintenance, as did much of the other work of the customer service representatives and the home service staff of the company.

Mind you, although the customer service staff was set at 60 persons, the personnel never numbered that many for long because of men being drafted or other causes. In the stores and in several rural districts, women proved themselves capable customer service representatives. And, with the draft still hitting the customer service ranks, other women may be employed to keep the staff complete. However, plans are under way to employ discharged servicemen who desire to do customer service work, even with a view of turning salesmen when the war is won.

Going to Keep Right on

But don't take this to mean that customer service is just a stop-gap during a merchandising vacation. Far from it! The above results speak so much in terms of customer satisfaction and goodwill that officials have requested the management to continue the customer service program after the war. Many thousands of customers have voiced in person, in letters, and in indirect compliments their appreciation and gratitude for this service. They realize more than ever now that the Georgia Power Company is truly "A Citizen Wherever We Serve." Both the customers and the company have benefited from the program and it will be continued as a permanent activity.

The New Jersey Rate Adjustment Plan

Explanation of the operation of a semi-automatic plan embodying both a stabilizing reserve and a flexible rate of return geared to the cost of equity capital for a selected group of utilities

HERBERT J. FLAGG, Chief Engineer, New Jersey Board of Public Utility Commissioners

A SIMPLE and fully automatic formula for the regulation of utility rates has not yet been devised and in view of the complexities of the problems involved probably never will be. Nevertheless, regulatory commissions have attempted by the establishment of planned procedures to reduce the number of disputable points to be disposed of when utility rate adjustments are under consideration. The most recent attempt of this kind is the rate adjustment plan adopted by the New Jersey Board of Public Utility Commissioners for application to the electric department of the New Jersey Power & Light Co.

The New Jersey plan which was developed by the Board through discussions with representatives of the company is a sliding scale arrangement, if the term is used with its general meaning of any form of rate regulation in which the price of service decreases, according to the terms of a formula, as the income available to the utility for distribution as common dividends increases. Under the plan the company shares in increased earnings resulting from growth of revenues or reductions of cost levels, when such increased earnings are the basis for rate reductions. On the other hand, a deficiency of return is the basis for increases in charges to consumers.

Two Features

Two features particularly distinguish the plan. One is the stabilizing reserve and the other is the flexible rate of return geared to the cost of capital. Otherwise the New Jersey plan follows the general pattern of previous plans. It provides a mechanism to determine the level of reasonable return. To this extent it is semi-automatic. The question of reasonableness of expenditures for plant or for operating expenses and of accruals for depreciation must be considered in the annual proceedings contemplated under the plan. The responsibility for design of rate schedules to provide the return allowed by the plan remains with the company, subject, however, to approval.

The New Jersey plan was "tailor made" to fit a special situation. It is not intended, as some have supposed, for general application within the State, nor is it likely that the plan as fitted to the circumstances of the New Jersey Power & Light Co. would be appropriate for application to other situations. However, a generally similar plan can probably be applied in any normal situation where favorable factors are present.

Special Terms

It is believed that the significance of the special terms used in the plan will be apparent from the context of the explanation to follow of the operation of the plan.

Prior to April 1 of each year the company will submit a verified report showing all financial and operating data pertaining to the previous year, called the "test year", which are required in the administration of the plan. After checking the information the Board's staff will make its determinations of "experienced return" for the test year. The rate base is determined according to a formula and "basic return" is determined by multiplying the rate base by the "basic rate of return" and subtracting from the product an amount equal to 3 per cent of the balance in the stabilizing reserve at the beginning of the test year. The difference between experienced return and basic return is designated "additional return" or "return deficiency" as the case may be.

It was agreed early in the discussions that in determining the rate base, cost of reproduction would not be given weight. The rate base agreed upon is considered to represent "prudent investment" rate base since it is derived from the original cost of plant with several specific items added thereto. Depreciation is deducted but not in the full amount of the book reserve. Working capital is allowed to cover materials and supplies and cash requirements. However, the average balance in the tax accrual accounts is taken as a negative component of setting the cash requirements. Under present tax levels the practical effect of this provision is to eliminate the cash requirement component in full.

The rate base changes annually by net additions, by the change in the reserve for depreciation, by the amortization of the items in excess of original cost and by any variations in the allowance for working capital. For any test year the rate base before working capital is the average of that at the start and end of the year.

Rate of Return Derivation

The basic rate of return is comprised of three components

(a) debt capital,
(b) preferred stock capital,
(c) equity capital.

The first two components are deter-

ined by their annual cost rates to e company which once established o not change materially unless addi- ional or refunding securities are is- ued. Determination of the equity pital component is difficult in this tuation because the common stock f the company, being held by one wner, is not traded in the market. onsequently there is no direct means f determining the cost basis on which pital would be invested in the cur- nt equity situation of the company.

Equity Return

Therefore, it was necessary to de- se a method of deriving an index of e movement (not necessarily the vel) of the cost of equity capital in mparable situations. Out of about irty-five public utility companies ith publicly owned common stocks n were chosen as a "barometer roup." The selection was made with ference to two pricipal criteria: (a) olume and regularity of trading in mmon stock to be such that estab- shed prices are representative of in- stor appraisals, and (b) that the ock must be seasoned. These ten mpanies are named in the plan, and r their common stocks the earnings- ice ratios are determined from ock market transactions and their rnings statements. The influence of short run market fluctuations, usual ctors or accidental divergencies is inimized by a process of averaging. n intermediate product of this aver- ing process is called the "yearly rnings-price ratio" which, as an ad- tional precaution, is limited in any ar to not less than 6.5 percent and not more than 9 percent. The final sult of the process is the "average rnings-price ratio" to which is ap- ied a multiplier called the "capital ructure factor" in order to translate e ratio into a value that recognizes) the influence of capital structure n the earnings-price ratio, (b) the obability that the common stock of e New Jersey Power & Light Co. is less desirable investment than the mmon stock of the average com- ny in the group of ten, and (c) a argin to reflect cost of common ock financing. The capital structure ctor varies from 0.82 if all the capi- l is common stock to 2.16 if com- on stock plus surplus is 10 percent less of total capital.

For a hypothetical company gen- erally similar to New Jersey Power & Light Co. having an equity capital proportion in 1942 of 30.9 percent, the capital structure factor is 1.32. Thus, for such a situation, the average earnings-price ratio derived from the barometer group must be increased by 32 percent for use in the rate of return formula.

An example of the derivation of the average earnings-price ratio will demonstrate the process above described. The yearly average price for each stock is determined from the monthly high and low prices. The annual earnings per share of common stock may be obtained from financial statements supplied by any of the recognized services. From these earnings-price ratios as shown in the above table are computed. Studies indicated that the average of the median four ratios (identified by*) bears a more reasonably constant relationship to the industry over-all average than does the average of the ten ratios; therefore the former is used to determine the yearly earnings-price ratios.

Company Number	Earnings—Price Ratios 1940	1941	1942
1	7.9	10.8	13.3
2	7.6	8.1*	8.6*
3	5.7	6.6	7.8
4	7.5*	8.2*	7.5
5	5.7	7.9*	8.4*
6	8.4	9.4	9.5*
7	6.8*	6.8	7.9
8	5.3	6.9*	8.9*
9	5.9*	6.0	12.3
10	7.0*	8.3	11.7
Yearly E/P Ratio	6.80	7.78	8.85
Average E/P Ratio	6.76	7.10	7.81

The average earnings-price ratio is the artihmetic mean of the yearly earnings-price ratios for the current year and the two preceding years; for the year 1942 in this example it is 7.81 percent.

The calculation of the basic rate of return based on hypothetical data is shown in the table below. And it will be noted that for each component of capital the actual percent cost of money is multiplied by the percent of total capitalization to obtain the respective components of the basic rate of return. The equity capital return rate of 10.31 percent is obtained by multiplying the average earnings-price ratio of 7.81 by the capital structure factor of 1.32 as previously determined.

Stabilizng Reserve

As applied to the New Jersey Power & Light Co., the plan required the company to set up, out of its earned surplus, a stablizing reserve of $975,000 as at Dec. 31, 1943. The purpose of the stabilizing reserve is to provide a controlled reservoir from which transfers can be made to earned surplus in times of inadequate earnings. Thus return deficiencies may be offset in whole or in part, and rate increases that otherwise might be required are either avoided or diminished. At the other end of the scale the stablizing reserve is credited with all or a part of additional return in a test year until the amount in the reserve equals 6 percent of the rate base. All debits or credits to the stabilizing reserve are considered to be made as at Dec. 31 of the test year. Any amount of additional return not required for the stabilizing reserve is available to the company for corporate purposes, but it becomes the measure of rate reductions in the next year.

As the result of several studies under assumed conditions of alternating business prosperity and depression, it

Calculation of Basic Rate of Return in Hypothetical Case

	Amount	Capitalization Percent of Total	Annual Cost	Cost of Money Percent Actual	Weighted
Debt capital					
Bonds, Series A 3.0%	$7,000,000		$210,000		
Bonds, Series B 3¼%	3,500,000		113,750		
Unamort. D. D. & E.	(995,000)		53,630		
Net debt capital	$9,505,000	52.5	$377,380	3.97	2.084
Preferred stock capital					
4¼% stock-stated value	$3,850,000		$163,625		
Discounts & Expense	(835,000)		.....		
Net preferred stock	$3,015,000	16.6	$163,625	5.43	0.901
Equity capital					
Common stock	$4,250,000		.....		
Surplus	1,350,000		.....		
Total equity capital	$5,600,000	30.9		10.31	3.186
Total capital	$18,120,000	100.0			
Basic rate of return					6.17

( ) Denotes subtractive amount.

was concluded that a ceiling equivalent to 6 percent of the rate base would be reasonable. Such a reserve would absorb annual return deficiencies in a period of business depression, continuing for about three years, equal to 2 percent of the rate base, before significant rate increases would become necessary.

The studies made in connection with the plan show that as a consequence of business cycle fluctuations the pendulum effect of the formula on rate levels might tend to swing too far in either direction if rate adjustments are deferred until the reserve is either full or wholly depleted. To taper off the effect of rate changes, which may be made under the plan, sublevels are established in the reserve at 4½ percent and 1½ percent of the rate base.

Where Rate Changes Start

Rate reductions start when the reserve reaches the 4½ percent level and rate increases may start at the company's option, when the reserve falls to the 1½ percent level. For example, assume the balance in the reserve is $800,000, the 4½ percent level is $900,000 and there is an additional return of $200,000. The first $100,000 of additional return is transferred from surplus to stablizing reserve to bring it to the 4½ percent level. Of the remaining $100,000 of additional return, $50,000 is likewise transferred to the reserve and $50,000 remains in earned surplus. This latter amount, however, is the measure of rate reductions to be made immediately. If no rate changes have taken place during the test year the rate reductions now to be made would reduce return by 60 percent of $50,000, or $30,000 as hereinafter explained. Reductions in revenues may be accomplished either by rate schedule revisions, or the method of "billing credits," as the board may approve.

Return deficiencies are made up in full, to the extent of the balance in the reserve, by transfers to earned surplus. For example, assume the balance in the reserve is $400,000, the 1½ percent level is $300,000 and there is a return deficiency of $200,000. The company will recoup the deficiency by transferring $200,000 to earned surplus, leaving a balance of $200,000 in the reserve. This balance is $100,000 less than the 1½ percent level of $300,000, therefore the company may file revised rates calculated to increase experienced return by one-half of this difference, or $50,000.

If the reserve were full, the entire amount of any additional return goes to earned surplus, but it becomes the measure of rate reductions. Conversely, rates may be increased in the full amount by which a return deficiency is in excess of the reserve balance.

Since in practice it is unlikely that any rate adjustments will become effective earlier than April 1, the return in a given year may be affected by two different rate levels, one applying for three months and the other for nine months. In order to avoid cumulative over-correction of experienced return, the additional return or return deficiency is adjusted to reflect the full year application of any revised rates. There are also associated adjustments for taxes.

Customers' Interest

The plan recognizes the customer's equitable interest in the stabilizing reserve by three provisions: First, by the requirement that what would otherwise be the basic return shall be reduced by an amount equivalent to 3 percent interest on the reserve balance (this treatment is used instead of the administratively more difficult one of treating all or a portion of the reserve balance as a negative term in the rate base formula); second, by restricting the use of the reserve to offset return deficiencies; and third, by the provision that in the event of termination of the plan one-half of the existing balance in excess of $250,000 will be taken as the measure of subsequent benefits to the customers in the form of billing credits.

Management's Incentive

The management incentive feature of the plan is best illustrated by an example. The following assumptions are made:

Rate Base for test year	$20,000,000
Basic Rate of Return	6.00%
Experienced return—adjusted to 12 months'	$ 1,600,000
Stabilizing Reserve full at 6 percent of rate base	$ 1,200,000

Then the "basic return" is 6 percent of $20,000,000 minus 3 percent of $1,200,000 or $1,164,000, and the "additional return" is $1,600,000 minus $1,164,000 or $436,000. Since the stablilizing reserve is full the entire amount of $436,000 is available to the company as earned surplus. It also becomes the measure of the reduction in the return that is to be made through lower rates in the next year.

This measure is applied by dividing it into blocks, each of the first two blocks being measured by 1 percent of the rate base and any excess over 2 percent of the rate base being the third block. Future return is to be reduced by 60 percent of the first block, 75 percent of the second block and 85 percent of the third block. In the above example the calculation is as follows:

Additional Return Block Number	Amount	Reduction of Future Return Percent of Block	Amount
1	$200,000	60%	$120,000
2	200,000	75%	150,000
3	36,000	85%	30,600
Totals	$436,000		$300,600

Because of the effect of taxes based on revenue and income it would require in New Jersey, if no excess profits taxes are involved, a reduction in operating revenues (rates) of approximately $545,000 in order to accomplish a reduction in return of $300,600. Of course, nothing, as extreme as this example is expected to happen but, rate reductions in diminishing amounts will be experienced annually for several years.

The plan is subject to modification in the event of unforeseen circumstances that might make revision desirable. It is also subject to termination by either the Board or the company on written notice, otherwise its term is indefinite.

Under the plan the administration of the Board's responsibility will be greatly simplified; management can safely chart a budgetary course secure in the feeling that only extreme vagaries in business conditions can adversely affect the company's return; investors will be quick to recognize that the risk and uncertainties affecting capital committed to the enterprise are greatly minimized; and the lower capital costs and operating economies engendered by the operation of the plan will be translated into low and stable rates to the lasting benefit of customers.

Electrical Manufacturers

LOOK AHEAD

AN EDITORIAL STAFF REPORT

WHAT do the manufacturers see in the market for electrical and allied lines once materials and labor are again available for civilian production? How soon can supplies be had? At what price? Will they be pre-war or new designs?

These and a great many other questions which are on the tips of tongues today everywhere were asked by mail and personal interviews of a group of manufacturers that account for well over two-thirds of the industry's sales volume. The consensus which is contained in these pages is necessarily general because most of the actual determinations must wait until civilian production actually starts and all of the controlling conditions are present.

Needs Will Be Met

In general, it can be said that customers will be served immediately. They may not get all they order right away but it is not anticipated that they will have to stand in line. Inventory replenishment might have to wait, but not actual needs.

To get up to full-scale production will not take very long because there will not be the same serious reconversion problem that many other industries will have to face.

Manufacturers will make every effort quickly to win back the affections of pre-war customers through better distribution methods and sales forces, but they can't give much encouragement in the way of prices. In fact, there is every reason to believe that immediate post-war prices will be quite a bit higher than pre-war, provided OPA does not linger on.

Back to the Old Standbys

While most manufacturers have new products either ready or about to get their finishing touches, the pre-war design will be put in production immediately. If there are any "dream" devices they did not show up in this survey.

War substitutes do not have many advocates. A few will survive but mostly they will be discarded just as soon as the old material is available. The new light metals and plastics will be used more later but there is no immediate rush to get at them.

In spite of the simplification demanded by war, it appears that little of it will stick, not that the

manufacturer doesn't want it to but that he is much more concerned with giving the customer what he wants. Standardization appears to offer some concessions in price and delivery provided the customer wants them more than he does something special.

This survey which was made during the last two months in April so that the latest information would be available indicates clearly that with some minor exceptions post-war will pick up where pre-war left off. Some things were learned during the war which will be incorporated in post-war products but in general there will be very little change.

Wants to Get Back

The manufacturer shows every evidence of wanting to get back to his old customers. He will do everything he can to protect them in deliveries; he will pass on only as much of the cost increase as he has to; he will improve his sales contacts and regional warehouse stocks; he won't be hard boiled about simplification. He just plain wants to get back.

There is a general optimism over the outlook. Better business is anticipated—much better than pre-war. Some government controls are expected in order to prevent such things as pyramiding and runaway prices. In fact, a great many manufacturers appear to be favorable to such continuance at least until the first rush is over and production hits its stride.

For convenience of the reader we have grouped the twenty questions under some eight general headings. In each case a general resume is made which is followed by the summarized replies by class of manufacturers. This information was solicited on a confidential basis with the promise that no reply could be identified.

It should be pointed out that this survey was not made to obtain and publish information on post-war plans. The object was simply to ascertain opinions on what is now foreseen of conditions at an unknown future time and on how those conditions will probably be met.

Because of the great diversity of products covered by the survey, their groupings for purposes of report had often to be somewhat arbitrary. Also the necessity for compression of several opinions, sometimes expressed with considerable qualification and in some instances conflicting, into the small compass of one or two sentences does not allow much latitude for explanatory detail.

Overall Picture

Thus some readers may know of conditions affecting certain products that seem to be at variance from the opinions presented here. In such cases it should be remembered that the intention is to present an overall impression, not to furnish definite information on specific products.

The following manufacturers contributed to this cross-section of post-war market conditions:

Ajax Electrothermic Corporation
Allis-Chalmers Manufacturing Company
Aluminum Company of America
American Transformer Company
Anaconda Wire & Cable Company
Babcock & Wilcox
Benjamin Electric & Manufacturing Company
Brewer-Titchener Corporation
Bulldog Electric Products Company
Burndy Engineering Company
Century Electric Company
Chrysler Corporation—Airtemp Division
Cornell-Dubelier Electric Corporation
Crouse-Hinds Company
Day-Brite Lighting, Inc.
Electric Power Equipment Company
Electric Service Manufacturing Company
Fairbanks, Morse & Company
Fostoria Pressed Steel Corporation
General Cable Company
General Electric Company
Holophane Company
I-T-E Circuit Breaker Company
Johns-Manville Corporation
Kerite Insulated Wire & Cable Company
Landers, Frary & Clark
Lapp Insulator Company
Leeds & Northrup Company
Locke Insulator Corporation
Miller Company
Nash-Kelvinator Corporation
Ohio Brass Company
Ohio Crankshaft Company
Okonite Company
Philadelphia Electrical & Manufacturing Company
Porcelain Insulator Corporation
Proctor Electric Company
Reliance Electric & Engineering Company
Republic Flow Meter Company
Rockbestos Products Corporation
John A. Roebling's Sons Company
Rome Cable Corporation
Sangamo Electric Company
Silvray Lighting, Inc.
Simplex Wire & Cable Company
Square D. Company
Standard Transformer Company
B. F. Sturtevant Company
Sylvania Electric Products, Inc.
Thomas & Betts Company, Inc.
Union Metal Manufacturing Company
United States Rubber Company
R. E. Uptegraff Manufacturing Company
F. W. Wakefield Brass Company
Westinghouse Electric & Manufacturing Company
Weston Electrical Instruments Company
Wheeler Reflector Company
Wiremold Company

DELIVERIES

How soon after the war ends can volume shipments be made?

(a) Will materials for manufacture be a bottleneck?

(b) Will adequate and competent labor present a difficulty?

▶ *Because electrical and power plant equipment manufacturers will have little or no reconversion problem, deliveries in general can be made just as soon as priority restrictions are removed. Although a number of manufacturers expected delays, turbine deliveries can be made within a year and transformers two to six months. Domestic appliances were variously estimated from three to four months.*

With few exceptions no bottleneck was expected in materials supply, and in general labor was expected to be plentiful. Some producers, however, were none too hopeful about the supply of skilled labor.

Boilers. Shipments can be made as soon as the market develops. No difficulties are anticipated as regards materials, nor as to labor.

Pumps, Condensers, Compressors. Immediate shipments are possible. Materials situation already beginning to ease. Labor will not be a problem.

Turbo-Generators. Within the first year after the war ends shipments can be made, assuming release from controls on scheduling and procurement of materials. Materials will be plentiful. Opinion divided on labor.

Oil and Air Circuit Breakers, Switchgear. Immediate shipments seem probable. No serious difficulties anticipated as regards labor and materials.

Transformers, Power and Distribution, and Regulators. Estimates as to shipments generally state without delay, although a couple run to six months. Materials are plentiful now and labor will be no problem.

Capacitors. Shipments will be made as requested and neither supplies nor labor will cause trouble.

Wire, Cable, Conductor Materials. Practically all agree shipments will be at once, although one states three months. No bottleneck in materials is anticipated except possibly in synthetics for insulation. Plenty of good labor is expected to be available.

Meters, Instruments, Regulating Devices. There are many specialized products in this group and on some of these shipments may lag. Generally speaking however, shipments can be made very quickly after war ends. Materials and labor will not present any difficulty.

Power Specialties, Bus Hardware, Switches. Post-war shipment expectations are from no delay to eight weeks after war ends. No difficulties anticipated as to materials or labor.

Porcelain Insulators. Deliveries at once or within 60 days. No problem on materials and labor.

Overhead Line Specialties, Hardware, Fuses, Cutouts. Most items will have immediate delivery. Cutouts may be slow. Materials and labor prospects satisfactory.

Underground Specialities, Materials, Fittings. Prompt deliveries. No difficulty with either materials or labor.

Industrial Equipment and Wiring Devices, Panelboards, Ducts, Fittings. Right after war ends shipments can be made by most manufacturers. Some may be delayed a month or so. Materials for a few items may cause slight difficulty, but generally there will be none.

Industrial Control Equipment. No delays in shipments. Materials easy and labor also.

Motors. Estimates on shipments range from immediately to nine months. General feeling that materials will be easily available, but some misgiving expressed.

Industrial Heating Equipment. Immediate shipments and no difficulty in regard to materials and labor.

Lighting Equipment. Many items in this group could be shipped now if permission were given, most of them will be ready for immediate shipment when the war ends and a few will require up to nine months. No particular problem of material but labor is foreseen as a possible difficulty in one case.

Appliances. It will take three or four months to begin shipments. There may be difficulties in obtaining materials, but labor will be no great problem.

How long a time will be required to get into full-scale peace goods production?

▶ *Most manufacturers can go into full-scale production in less than 60 days. Circuit breakers are expected to take four to five months and some domestic appliances from as long as six months for the smaller devices up to a maximum of 18 months for the larger ones. Individual manufacturers with reconversion problems estimated longer periods.*

Boilers. Generally none there appears to be no serious conversion problem.

Pumps and Compressors. Almost immediately. The maximum stated time was 60 days and this is due to change over from marine type equipment.

Turbo-Generators. Manufacturers will vary in conversion time. One will have "no delay in conversion" while another states normal production "within a year."

Oil and Air Circuit Breakers, Switchgear. Time interval varies from immediately to four or five months. This is due mainly to the uncertainty of how and when war production will be terminated.

Transfers, Powers and Distribution, and Regulators. Manufacturing on full scale will begin immediately for most concerns. Three estimate up to six months will elapse before full peace time production is reached.

Capacitors. No time delay since manufacturers now exceed peace time requirements.

Wire, Cable, Buses. Production on peace time basis will be accomplished immediately by most manufacturers, however, one influential concern expects eight months to pass before this becomes true.

Meters, Instruments and Regulating Devices. Normal production will immediately be possible. The time element will vary somewhat with the items since with a few conversion time will be needed. Maximum delay will be 60 days.

Power Specialties, Bus Hardware, Switches. Approximately ten weeks may elapse previous to reaching full-scale production.

Porcelain Insulators. Large scale production feasible for most manufacturers immediately; others estimate 30 to 60 day time delay.

Overhead Line Specialties, Hardware, Fuses and Cutouts. Immediate normal peacetime production on most items. Cutouts will be a little slower in coming back while hardware lines will take nine months to a year.

Underground Specialties, Materials and Fittings. Nearly all manufacturers state little or no delay.

Industrial Equipment, Wiring Devices, Panelboards, Ducts, Fittings. For the most part there is no reconversion problem in this classification, therefore delays will be few and short. Thirty days is the longest estimated delay.

Industrial Control Equipment. Immediately to 90 days of elapsed time for full peace production are the industries' reports.

Motors. Estimates vary from "no delay" to "nearly a year". Expressions indicate that "if a free market returns," this will force production sooner.

Industrial Heating Equipment. There is no time delay expected in producing this equipment. In one instance pre-war volume in 1944 is expected.

Lighting Equipment. With but two exceptions all manufacturers expect immediate peace time production. The two exceptions estimate three and six months.

Appliances. The time elapsed on small appliances is expected to be approximately six months, on large appliances twelve to eighteen months.

Will resumption of peace production be retarded by

a. Disposal of present materials inventories?

b. Retooling?

c. Shop and manufacturing facilities rearrangements?

d. Labor changes?

► *Several manufacturers saw some possible slowing up of full resumption of production by reason of difficulties in disposing of present materials inventories, but nothing very serious. Some retooling and shop rearrangement may cause delay, especially in appliances, meters and wiring devices. Almost no problem is foreseen through labor shifts.*

Boilers. No serious problems in these regards.

Pumps, Condensers, Compressors. Cutbacks ordered in present production might make inventories somewhat of a problem. No difficulties anticipated on the other three points.

Turbo-generators. Labor may present some difficulty, no other retarding factors.

Oil and Air Circuit Breakers, Switchgear. Inventories may cause some difficulty, otherwise no trouble.

Transformers, Power and Distribution, and Regulators. Inventories will be no problem, nor retooling except in one case. Rearrangements of shop facilities may take some time. Generally no problem of labor.

Capacitors. No difficulties foreseen.

Wire, Cable, Conductor Materials. Disposal of inventories may be troublesome in a few cases. On the other points no difficulties are anticipated.

Meters, Instruments, Regulating Devices. Retooling and facilities rearrangements appear to present somewhat of a post-war problem. There may be slight difficulties in regard to materials inventories.

Power Specialties, Bus Hardware, Switches. No difficulties in the way of resumption of peace production.

Porcelain **Insulation.** Anticipate no trouble in getting into production.

Overhead **Line Specialties, Hardware, Fuses, Cutouts.** Except in one case where disposal of present inventories was seen to be a problem, all others state that no difficulties will be encountered.

Underground **Specialities, Materials, and Fittings.** No normal production hindrances foreseen.

Industrial **Equipment and Wiring Devices, Panel Boards, Ducts, Fittings.** Material inventories and labor seem to pose no problem, but retooling and facilities rearrangements may have a retarding effect.

Industrial **Control Equipment.** Danger is seen in large stocks of special controls manufactured for war uses and of no value in a peace market. No particular difficulties foreseen as regards other factors.

Industrial Heating Equipment. No retardation of peace production anticipated.

Motors. Except for one expression of probable delay caused by requirements for retooling, shop conversion and labor, general opinion is that peace production will not be retarded.

Lighting Equipment. Possibly a certain amount of retooling will be necessary in fixture production, but otherwise there seem to be no retarding factors. Expect to use fewer women in the plants.

Appliances. Retooling and shop rearrangements appear to be of most concern in this group. Inventories and labor are not foreseen as difficult factors.

DISTRIBUTION

Will any changes be made in methods of distribution, that is, will there be more or less use made of:

a. **Wholesalers?**

b. **Sales Agents?**

c. **Factory Representatives?**

d. **Regional Warehouse Stocks?**

▶ *Distribution generally will be greatly strengthened for the post-war market. A great many changes are contemplated. In the smaller devices a stronger trend toward the wholesaler is seen. Sales coverage will be much more complete than before the war and, while some will try to get this through a greater use of the sales agent, the disposition seems to be to trend more to the direct factory representative. One thing stands out clearly, and that is more emphasis on better and more complete geographic location of regional warehouse stocks.*

Boilers. No change expected.

Pumps, Condensers, Compressors. Sales forces will be greatly strengthened; in some cases doubled immediately following the war. Warehouse stocks are now depleted and these will be built up. New warehouses on the west coast and in the mid-west area.

Turbo-generators. More sales coverage is to be expected in the post-war era. Wholesaler and warehouse conditions will not affect turbo-generator distribution.

Oil and Air Circuit Breakers, Switchgear. More factory representatives and more complete regional warehouse stocks are anticipated following the conflict.

Transformers, Power and Distribution, Regulators. Most concerns will continue the same set-up they had in pre-war days. Two manufacturers expect to obtain improved distribution by larger use of factory representatives and better geographical placement of their warehouses.

Capacitors. No change is looked for in any phase. Coverage and stock conditions have been and are expected to remain satisfactory.

Wire, Cable, Conductor Materials. A slight general increase in use of wholesalers, sales agents and regional warehouses with quite a bit more emphasis being placed on the factory representative.

Meters, Instruments, Regulating Devices. The wholesaler and regional warehouse conditions will approximate pre-Pearl Harbor days. In several cases more sales agents and factory representatives will enter the field to give more complete coverage.

Power Specialties, Bus Hardware, Switches. No change in regional warehouse or factory representative condition is anticipated. The wholesaler will be some stronger in this field while the number of sales agents will increase.

Porcelain Insulators. The wholesaler, factory representative and regional warehouse will find increased use after the war.

Overhead Line Specialties, Hardware, Fuses, Cutouts. Approximately 50 percent of the manufacturers expect no change. The other 50 percent will increase use of all four means of contacts.

Underground Specialties, Materials and Fittings. Several changes are expected to exploit new territories. All four methods will be used to obtain this coverage.

Industrial Equipment and Wiring Devices, Panelboards, Ducts and Fittings. Wholesaler and factory representative will be much more extenively used post-war. Warehouses, also, where new territories are entered.

Industrial Heating Equipment. Not much change contemplated except by companies now having national coverage who will use more wholesalers and factory representatives.

Industrial Control Equipment. Wholesalers' influence will be greater than before the war. Sales agents and factory representatives will remain about the same. Control equipment will be more quickly distributed through carefully located warehouses.

Motors. Sales agents, factory representatives, regional warehouse stocks will be used more, while the wholesaler will be in approximately the same position as previous to the war.

Lighting Equipment. Manufacturers selling through wholesalers exclusively and those having national coverage expect to make no changes. The others expect to strengthen their distribution set-up by use of more wholesalers and factory representatives. More and better geographical warehouse distribution.

Appliances. Most manufacturers expect to make no fundamental changes in methods of distribution. Exceptions are "fewer more carefully selected wholesalers" and sales "direct to the dealer" by two manufacturers. A few will use wholesalers exclusively following the war.

ORDERS

Will orders be filled in full in order of receipt?

► *An effort will be made to fill all orders in the order of their receipt. However, a wide range of producers, cognizant of the demands that will arise because of very low customer inventories, are expecting a continuance of some form of government control. If that is not in effect then in many cases the individual manufacturers are expecting to have to make partial shipments with preference to old customers. Allocations, if necessary, will probably be confined to large orders with some manufacturers refusing to accept excessive orders.*

Boilers. Expect W.P.B. to be continued and to prescribe priorities for post-war deliveries.

Pumps and Compressors. Yes, but each manufacturer expects to give preference to his old customers.

Turbo-Generators. Expect without exception to fill orders in order of their receipt.

Oil and Air Circuit Breakers. Orders will be filled in order of receipt is the opinion most often expressed. However the thought persists "that we will be on priority basis for some time after the war—perhaps for six months."

Transformers, Power Distribution. Policies will vary widely on this point from "first come first served" to "will take care of our old customers first." Several companies expect government regulation to direct distribution through priorities.

Capacitors. Expect to fill orders as they are received.

Wire, Cable, Conductor Materials. Orders will be filled as received by most companies. Several would not accept excessive demands on limited stocks.

Meters, Instruments, Regulating Devices. Most manufacturers expect to complete orders as received.

Power Specialties, Bus Hardware, Switches. No foreseen difficulties in immediately fulfilling orders.

Porcelain Insulators. Generally it is expected that orders will be filled as received. In special cases this will be impossible.

Overhead Line Specialties, Hardware, Fuses, Cutouts. Small orders will be filled as received by the major portion of manufacturers; if preference is given it will be to old customers.

Industrial Equipment, Wiring Devices, Panelboards, Ducts, Fittings. Should orders be normal in arrival, orderly shipment will be possible.

Industrial Control Equipment. Orders if not too large will be filled in order of receipt. If too large, attempts will be made to spread the facilities over pre-war customers.

Industrial Heating Equipment. No difficulties seen in filling prospective orders.

Motors. No apparent reasons why they should not.

Lighting Equipment. In general if distributors do not overorder, deliveries will be normal.

Appliances. The replies show three to one that orders will not be filled normally. Some form of allocation is expected by most of the manufacturers.

Will it be necessary to make some kind of allocation in filling orders?

Are pre-orders being taken?

▶ *While most manufacturers do not anticipate the need for allocations in filling orders, there are enough who do to make this a likely possibility, especially as a protection to small orders. Appliance manufacturers definitely foresee allocations and motor suppliers are pretty much of the same mind. Except for appliance producers who do not want them, manufacturers generally are well disposed to accept pre-orders and some are coming in, but the volume is very small. There is, however, a hang-over of non-priority orders which are still on the books on an "if, as and when" basis.*

Boilers. Probably no allocations will be necessary.

Pumps, Condensers, Compressors. Possible that allocations may be desirable in some cases. There appears to be a rather respectable accumulation of non-priority orders which will receive first attention when war ends.

Turbo-Generators. Deliveries during war period are definitely matters of allocation and a certain degree of allocation is normal in peace time operations. Pre-orders are already in and more are expected.

Oil and Air Circuit Breakers, Switchgear. Some opinion that allocations will be necessary, particularly on large orders. Pre-orders are being accepted as they come in.

Transformers, Power and Distribution, Regulators. Possibility of allocation in rural line transformers is one opinion. Another says take care of established customers first. General idea is that allocations not necessary. Some pre-orders being taken.

Capacitors. No need for allocations unless orders are too large; pre-orders none.

Wire, Cable, Conductor Materials. General opinion allocations not necessary, but a couple of manufacturers think they may be. No great volume of pre-orders.

Meters, Instruments, Regulating Devices. On certain items, not now in production, allocations may be necessary. Some pre-orders coming in.

Power Specialties, Bus Hardware, Switches. Allocations expected by only two; few pre-orders. Some backlok of non-priority orders.

Porcelain Insulators. Some opinion anticipates need for allocations. Pre-orders not general.

Overhead Line Specialties, Hardware, Fuses, Cutouts. Probably a certain amount of allocation to permit deliveries on small orders. Some pre-orders.

Underground Specialties, Materials and Fittings. No post-war allocation expected.

Industrial Equipment and Wiring Devices, Panelboards, Ducts, Fittings. Allocations may be necessary at first on some items. No pre-orders in sight.

Industrial Heating Equipment. No need for allocations. Some pre-orders.

Industrial Control Equipment. Large orders may have some allocation to allow small ones to be filled. Pre-orders entailing design are welcomed but volume is small.

Motors. Quite general feeling that allocations will be necessary. Some pre-orders are being taken, but not always with enthusiasm.

Lighting Equipment. Allocations may be necessary on some items, but are not generally anticipated. No large volume of pre-orders yet.

Appliances. Allocations definitely foreseen. Only slight disposition to accept pre-orders.

PRICES

Will prices be at prewar level, higher or lower?

▶ *The whole post-war price situation hinges on the continuance of government price control. Were that to be removed after the war prices definitely would go up. There were a few cases where competition was expected to hold prices to the pre-war or lower levels and some manufacturers were even of the opinion that lower prices could be offered. Nobody seemed to expect any relief by way of lower material or labor costs.*

Boilers. A thorough conviction exists that a rise will come at the time the freeze is removed.

Condensers, Pumps and Compressors. Divided opinion. 50 percent believe no change for one to two years, 25 percent see recession of 10 to 20 percent and 25 percent say rise must come.

Turbo-Generators. Quotations on land turbines have been unchanged since 1939 and any change will probably be to a slightly higher level.

Oil and Air Circuit Breakers, Switchgear. Estimates indicate slight rise. Concern is felt about the influence of government on labor and material costs.

Transformers, Power and Distribution, Regulators. Expect reasonable rise subject to some kind of governmental control. Wages are not expected to drop. Direct labor content of cost has risen above 60 percent. Overall costs have risen about 20 percent.

Capacitors. A gradual recession has taken place for the past two years. It is not expected that present quotations will change from their present levels. OPA will be the deciding factor.

Wire, Cable, Conductor Materials. Rise is to be expected, but two factors make it difficult to predict (1) large government owned stocks of copper if held off the market will allow a higher figure but if dumped will do the reverse and (2) aluminum will enter the field in much greater quantity than ever before.

Meters, Instruments, Regulating Devices. Trend will be toward higher levels unless more efficient methods of production and distribution are found to offset the expected higher labor and material costs.

Power Specialties, Bus Hardware, Switches. Costs and selling prices will certainly not be lower and if governmental control is removed will be higher. Estimates of 20 to 30 percent rise are made.

Porcelain Insulators. Somewhat higher than present quotations. Labor costs and material conditions will determine extent of rise.

Overhead Line Specialties, Hardware, Fuses, Cutouts. Opinions are quite evenly divided between a slight rise and slight decline.

Underground Specialties, Materials and Fittings. Labor costs and governmental regulations will put quotations at a slightly higher level.

Industrial Equipment, Wiring Devices, Panelboards, Ducts and Fittings. Quotations will be somewhat higher on industrial equipment. Labor and taxes are the two items that will force this rise. Some specialized items may be driven downward by increased competition.

Industrial Control Equipment. Quite stable but opinions expressed are that prices will rise unless OPA holds them to their present levels.

Motors. Quotations will depend upon OPA ruling. Manufacturers say prices cannot be lower and should be higher.

Industrial Heating Equipment. Probably remain at present level but under favorable conditions may drift a little lower.

Lighting Equipment. Opinions are widely separated. Three evenly divided groups say (a) prices will be lower (in some cases 20 percent below 1939), (b) will maintain present level since "it is perilous to do otherwise," (c) must be higher.

Appliances. All expressions are that a rise is coming. One large manufacturer believes it will be from 25 to 35 percent.

Is uncertainty as to government tax policies in the post-war period a difficulty in the way of setting price levels?

▶ *Manufacturers are fairly evenly divided that uncertainty as to tax policy makes it difficult to set price levels. There were comments that the uncertainty would make long-range planning difficult. One gets the impression of a general uneasiness about post-war taxes but a feeling nevertheless that they will not greatly affect prices.*

Boilers. An increasing difficulty in the future.

Pumps, Condensers, and Compressors. Uncertainty is a problem since taxes eat directly into profits.

Turbo-generators. Sounder tax legislation would certainly ease the situation.

Oil and Air Circuit Breakers. Approximately 75 percent believe that government could assist in establishing price bases by a definitely stated tax program. The remaining 25 percent do not feel it is of too much importance.

Transformers, Power and Distribution, Regulators. Uncertainty increases the difficulty is the opinion of over 70 percent of the transformer manufacturers. The minority state that figures will be set by market levels and that most of the "hollering is on income and profits taxes which have no bearing on prices. If we raise prices we just have more taxes to pay."

Capacitors. Will not materially affect the price situation. However, a definite tax policy should be determined and stated by the government.

Wire, Cable, Conductor Materials. With very few exceptions all replies say that tax policies increase the problem. "Tax policies of government, or any plans government may continue or develop toward controlled economy will all have profound bearing in setting price levels."

Meters, Instruments and Regulating Devices. No additional problem is added by the government's indefinite tax policy is the opinion stated in most replies.

Power Specialties, Bus Hardware, Switches. Certainly tax policy uncertainty adds to the difficulty of setting price levels on hardware and switches.

Porcelain Insulators. Opinion about evenly divided.

Overhead Line Specialties, Hardware, Fuses, Cutouts. By a ratio of two to one the manufacturers feel this will not materially affect the establishment of a price structure on line hardware, etc.

Underground Specialties, Materials and Fittings. Definite knowledge of government policy would be a great help.

Industrial Equipment, Wiring Devices, Panelboards, Ducts, Fittings. Approximately 55 percent believe that the uncertain tax situation will not affect the price levels. Remaining 45 percent think that it will and say that business may adjust its prices to tax levels.

Industrial Controls. Most answers say that tax uncertainties will have little immediate bearing but they add to the general difficulty of doing business.

Motors. About 60 percent state that tax uncertainties add difficulty while 40 percent feel that there is no effect.

Industrial Equipment. By a ratio of two to one the replies indicate that the government's lack of a settled tax program does increase the difficulty.

Lighting Equipment. About one-half of the answers say that taxes will be taken in stride and that uncertainty will not have any material effect. The remainder state that it will but that "we will take advantage of every known method of manufacture to keep costs down."

Appliances. Effect will not be too great, manufacturers feel, but some are not too sure since they are still designing and have not as yet reached the price setting stage.

PRODUCT DESIGN

Will production of pre-war models and designs be resumed?

▸*With few exceptions, production of pre-war models and designs will be resumed. The most notable exception is lighting fixtures in which several designs will be discontinued. Some lines will be dropped and in a number of instances improvements will be made either immediately or as soon as possible.*

Boilers. Yes. Same types will be made but with improvements.

Pumps and Compressors. Production will be resumed with improvements in design.

Turbo-generators. Generally, manufacturing will continue on pre-war items for a year following the conflict.

Oil and Air Circuit Breakers. In all cases pre-war models and designs will be continued.

Transformers, Power and Distribution Equipment. Major opinion is resumption. One manufacturer will continue with only 50 percent of pre-war models while improvements will appear in several cases.

Capacitors. Will continue with same models since there has been no change in accepted designs.

Wire, Cable, Conductor Materials. Most will again produce pre-war designs but the solving of the crude rubber question appears to hold the answer on cables.

Meters, Instruments and Regulating Devices. Items of pre-war design will be manufactured by all concerns. Some slight improvements will appear. One manufacturer will continue with 65 percent of the old designs, replacing the other 35 percent with new models.

Power Specialties, Bus Hardware, Switches. Accepted designs will continue to be made in most cases.

Porcelain Insulators. Most replies indicate continuance of pre-war designs. Some changes are foreseen.

Overhead Line Specialties, Hardware, Fuses and Cutouts. Production will be resumed with contemplated changes to be made as soon as feasible.

Underground Specialties, Materials and Equipment. Pre-Pearl Harbor designs will be continued in all cases. Some obsolete models will be discontinued.

Industrial Equipment and Wiring Devices. With the exception of a few discontinued items the manufacture of pre-war designs will continue.

Industrial Control Equipment. Pre-war designs will be manufactured immediately—with some improvements as soon as retooling can be completed.

Motors. Pre-war design will be continued. In several cases, and in all as soon as possible, planned improvements will be made.

Industrial Heating Equipment. Wartime improvements will be incorporated in post-war products.

Lighting Equipment. Some pre-war designs will be made but many changes and new designs are contemplated shortly after the war.

Appliances. Pre-war designs will again be produced to meet the waiting market.

Will models now being produced for war purposes or under war conditions be continued?

► *It is generally admitted that the effect of war design will be seen on post-war equipment. The new will be combined with the old. As many war designs as are applicable to civilian use are expected to remain. Those which are special will probably be dropped.*

Boilers. No startling changes contemplated since the pre-war models were not changed.

Pumps and Compressors. Most marine or navy models will be discontinued unless found applicable to land use.

Turbo-generators. Some features developed during the war will become a part of the post-war product. Experience with war-developed units will assist in "specials" to be made for special applications.

Oil and Air Circuit Breakers. Improvements will be continued in post-war production.

Transformers, Power and Distribution, Regulators. Pre-war design and war numbers are for the most part the same. Some improvements will be made.

Capacitors. Any special war models will be discontinued, but these are not many.

Wire, Cable and Conductor Materials. Some of the items designed and produced for the armed forces will be continued for civilian use. One of the great and unanswered questions is the fitness of various synthetics for wire and cable insulation.

Meters, Instruments, Regulating Devices. Expect a sharp drop in aviation instrument manufacture, otherwise will continue with production of war models.

Power Specialties, Bus Hardware, Switches. Will continue since bus hardware and switches are normal peace-time products.

Porcelain Insulators. Discontinued unless by slight changes they become applicable to industrial use.

Overhead Line Specialties, Hardware, Fuses, Cutouts. In several instances protection equipment designed for the signal corps will be added to regular lines.

Underground Specialties, Materials and Equipment. Established designs will continue to be made.

Industrial Equipment, Wiring Devices, Panelboards, Ducts, Fittings. New war-designed products will be continued by most manufacturers.

Industrial Control Equipment. In cases where war models are special they will be discontinued. However, in several cases the effects of war design will show in the design of peace products.

Motors. A few of "specials" will remain in production after war orders have ceased.

Industrial Heating Equipment. No changes foreseen.

Lighting Equipment. Some designs will continue but the field will eventually gravitate toward a combination of the best pre-war and wartime designs. The effects of lighter metals, heavier guages and plated finishes will be noticed.

Appliances. All manufacturers of appliances have converted to war production. Indications are 100 percent that manufacturers expect to leave the war products behind them when returning to normal fields.

Are peace time products ready for production?

► *A number of new peace-time products are ready for production and most manufacturers are working on new devices. Whether they will be brought out right after the war has not been determined in all cases. Tool making has delayed a lot of this work and machine and skilled labor shortage is expected by others to be a bottleneck.*

Boilers. No radical changes; ready for production of prewar models.

Pumps, Condensers, Compressors. New models will be brought out after a slight delay. Most concerns have the new designs "all set" or the war model equipment changes well in hand.

Turbo-Generators. In general, production of modified and improved wartime generators can begin almost immediately.

Oil and Circuit Breakers. Development work is still in progress in the greater number of plants. In two instances most of this has been completed and production of peacetime models could begin almost immediately.

Transformers, Power and Distribution, Regulators. Models produced immediately following the war will be somewhat improved over prewar designs due to

provement in the art during the war period. In me cases designs of new type transformers are ready t the shortage of trained manpower has not allowed velopment and test of the proposed units.

apacitors. All set for peacetime production.

Wire, Cable, **Conductor Materials.** Unable to devote uch time to thought of postwar products. There ll be few new designs immediately available.

eters, Instruments, **Regulating Devices.** A small per-ntage of replies say new models right away. The large rcentage state that new models will be available later.

ower specialties, **Bus Hardware, Switches.** Planning peacetime models is only partially completed and nsequently production on most new items will be layed.

rcelain **Insulators.** Only in one case are peace time dels ready for production. For most concerns de-opment work is still in progress.

verhead **Line Specialties, Hardware Fuses, Cutouts.** tterns, dies and tools in some cases are all ready and oduction of new models will begin immediately. In her cases difficulties of retooling and liquidation of cks will fix the date of new model production.

derground **Specialties, Materials and Fittings.** New signs can appear as soon as the manufacturers can tain the tools and machines.

dustrial **Equipment, Wiring Devices, Panelboards,** cts, **Fittings.** Manufacturers making equipment for services expect to continue producing those items plicable to peace time industrial economy. Some irely new models are expected.

dustrial **Control Equipment.** For the most part, not dy with new peace time models.

otors. Little time delay with the slight changes that expected following present abnormal conditions.

dustrial **Heating Equipment.** Approximately two-rds report that designs are either ready, or nearly so production. The remaining third expect to con-ue production of their prewar designs plus those ded during the war years.

ghting **Equipment.** About 50 percent say either dy for immediate production or will be after some ooling. The others have not completed new designs are not contemplating any major changes in their ipment.

pliances. Not ready to produce new peace time dels. Some expect that the models produced im-diately after the conflict will be similar to the last war models. One manufacturer has completed a set of designs and will be ready to produce after ooling.

Are any radical new designs or models in practical contemplation?

► *There will be improvements in design but little that is radically new is contemplated. Even appliance manufacturers say that the "dream world" will have to wait for a while. Synthetics are expected to bring some new ideas in insulation and the gas turbine is cited. In general, however, the improvements will not involve radical departures.*

Boilers. No departures from established practice.

Pumps, Condensers, Compressors. Apparently there will be some changes in, and additions to, lines of products in this group.

Turbo-Generators. Yes, the gas turbine. In steam units some changes are planned but nothing startling.

Oil and Air Circuit Breakers, Switchgear. There are changes coming, but no one knows how quickly.

Transformers, Power and Distribution, Regulators. New features in distribution transformers, improvements in power sizes and larger availability of dry type designs are in prospect.

Capacitors. Nothing startling in view.

Wire, Cable, Conductor Materials. Synthetic insulations will play a large part in the changes anticipated in these products.

Meters, Instruments, Regulating Devices. In watt-hour meters no change is anticipated; in indicating, recording, control and regulating instruments there will be many departures from pre-war designs.

Power Specialties, Bus Hardware, Switches. Several new things in prospect in this field.

Porcelain Insulators. Concensus is no radical changes seen, but one manufacturer intimates something new.

Overhead Line Specialties, Hardware, Fuses, Cutouts. Hardware items, no particular changes. Improvements toward interchangeability of fuses and use of the new metals. Several new specialties ready for post-war market.

Underground Specialties, Materials and Fittings. Design modification that normally would have been scattered over the last three or four years will be made "in one lump."

Industrial Equipment and Wiring Devices, Panelboards, Ducts, Fittings. Little change foreseen in standard wiring devices and fittings, but there will be new items in wiring assemblies, panel devices and distribution bus systems.

Industrial Control Equipment. Advances embodying wartime improvements are expected to be ready.

Motors. No changes in established motor lines, but improved solutions to specialize drive problems are anticipated.

Industrial Heating Equipment. Large development in induction and dielectric heating proven in war production will make much new equipment available.

Lighting Equipment. New designs in fixtures, more definitely functional, are in prospect.

Appliances. The "dream world" appliances, so widely publicized, will wait a while. In the meantime the post-war market will be offered products, improved, but essentially the same as pre-war.

Are any new products to be added to the line?

(a) What are they?

(b) How soon will they come out?

► *With few exceptions the manufacturers expect to add new products to the line. These range all the way from normal improvements and war adaptations to brand new devices. The electronics field particularly is calling for new products. Many of these new devices are now ready and some will go on the market just as soon as materials are available. Others will be held back, some, it was reported, as much as three years.*

Boilers. Expect to keep producing boilers with improvements.

Pumps, Condensers, Compressors. New design of fans may be expected from 18 to 24 months after the war. Low price general duty pumps will appear for rural application. Expect large orders for export trade at "odd" frequencies.

Turbo-Generators. New products will be added in some instances to obtain a more complete line. Some immediate limited activity on the gas turbine.

Oil and Air Circuit Breakers, Switchgear. Nothing sensational is expected to be added to the breaker and switchgear field. Additions and improvements, however, will be forthcoming directly following the war.

Capacitors. New designs in capacitors brought about by high-frequency application are forecast for shortly after the war.

Transformers, Power and Distribution Regulators. New transformer designs, both oil-immersed and dry, will appear shortly after the war.

Wire, Cable, Conductor Materials. Changes in standard design of conductor materials are expected in from two to three months following the war. Some manufacturers will bring out new materials needed in the electronic field.

Meters, Instruments, Regulating Devices. Electronics are expected to influence new meter, instrument and regulator designs. Some of these designs will be out two months after fighting ceases; others are in the development stage.

Power Specialties, Bus Hardware, Switches. Some new hardware will be ready for the market within nine months following the arrival of peace.

Porcelain Insulators. New styles of insulators and guy strains are under development and are expected to be in production within one year.

Overhead Line Specialties, Hardware, Fuses, Cutouts. New cutouts and specialties have been developed and will appear on the market at times varying from "just before war ends to three years following."

Underground Specialties, Materials and Fittings. A few of the items developed for the services will be continued. Some new materials can be expected shortly after the war.

Industrial Equipment, Wiring Devices, Panelboards, Ducts, Fittings. New equipment will appear immediately following the conflict. Some of these have been used by the services while others have just completed preliminary tests.

Industrial Control Equipment. There are many expected changes in industrial control equipment ready for release the moment shooting ceases. Direct current motor control, electronic and push button, speed regulators and direct current positioning systems are some of the items completed and ready for production. Development work is being carried on in the control field. Additional companies will have releases "within a short time."

Motors. Most manufacturers expect little change in motor design and construction during the early post-war period.

Industrial Heating Equipment. Revamping and additions are expected soon after the war, by some companies.

Lighting Equipment. Nearly all manufacturers expect to improve their line by additions to present numbers. Several expect to enter the commercial and industrial fluorescent lighting field. Complete lines of household fluorescent fixtures have been designed ready for release after the war. Some advancement is expected in street lighting equipment.

Appliances. Several manufacturers expect new domestic appliances, tooled and in production in from eighteen to twenty-four months. Others expect production of new models in half that time. Several manufacturers expect the first major appliances will be similar to the last pre-Pearl Harbor model.

MATERIALS

To what extent will war-time substitutions be continued in post-war products?

► *Very few of the war substitutes are expected to be permanently used after the war. Those that are kept will be materials that have proven superior to pre-war materials. Synthetics are expected to be used in wire and cable insulation and plastics are expected to have a greater usage. Also some alloys have been found during the war that have superior characteristics.*

Boilers. There were few substitutions made in the boiler industry and these will be discarded.

Pumps, Condensers, Compressors. Substitutes for aluminum and copper and brass expected to disappear.

Turbo-Generators. When government control is eliminated most will become past history.

Oil and Air Circuit Breakers, Switchgear. Circuit breakers and switch-gear equipment will contain only those whose physical or operating character have proved them superior.

Transformers, Power, Distribution, Regulators. The extent to which continued varies between manufacturers. One concern estimates 75 percent, another 15 percent, while others contemplate using none.

Capacitors. A limited few of the substitutes will be continued in the manufacture of capacitors.

Wire, Cable, Conductor Materials. Nearly all manufacturers agree that materials will affect post-war designs to a degree. One school of thought believes that as natural rubber returns to the market few substitutes will remain—except in certain special types of cable.

Meters, Instruments and Regulating Devices. With but one exception no manufacturer expects to use war-time substitutes to any great extent.

Power Specialties, Bus Hardware, Switches. Will not be greatly affected by war-time substitutions.

Porcelain Insulators. Will be affected very little.

Overhead Line Specialties, Hardware, Fuses, Cutouts. Substitutions will be continued in the post-war era to quite a great extent in some hardware lines. In fuses and cutouts, a few of the plastics will be retained as permanent features by some concerns.

Underground Specialties, Materials and Fittings. They will disappear unless superior to the original material.

Industrial Equipment and Wiring Devices, Panelboards, Ducts, Fittings. With the exception of a few plastics most concerns feel that substitution should disappear.

Industrial Control Equipment. Wartime substitutions are expected materially to affect designs. Plastic and molded materials having equal strength but less weight than pre-war materials will be continued as part of the product.

Motors. Limited wartime substitution will for the most part be continued only until regular materials become available. Those which will be continued permanently will be of a very minor nature.

Industrial Heating Equipment. There was unanimous agreement that there will be little if any of the war time substitutions used in post war manufacture.

Lighting Equipment. Little possibility exists that substitutes will be continued.

Appliances. Domestic appliances will not be greatly affected if the federal government will release peacetime materials.

To what extent will newly available materials, such as light metals, plastics and composite wood be incorporated in post-war design?

► *Except for wire and cables where synthetic insulation is expected to play an increasingly important role, the use of newly available materials will probably not be very great for some time at least. A number of manufacturers are working on designs that will embody the light metals or plastics and several indicated that the use at some later date might be very large. It was interesting to note that more was being done with the light metals than with plastics.*

Boilers. None will have any known effect on post-war boiler design. Industry still seeking metallurgical advances for higher temperature metals.

Pumps, Compressors, Condensers. There are possi-

bilities of using lighter metals and plastics for special pumps, fittings, compressors or condensers.

Turbo-Generators. Several manufacturers expect to use in a limited way some of the lighter metals.

Oil and Air Circuit Breakers, Switchgear. Light metals and plastics will be used in only a limited manner directly following the war but the belief exists that this will increase in time.

Transformers, Power Distribution, Regulators. At the present time indications are that light metals and composite woods will be used to a very limited degree.

Capacitors. No benefits seen at the present time in the use of light metals or composite woods.

Cable, Wire, Conductor Materials. Almost without exception all manufacturers state that plastics are here to stay and that their use will increase with time.

Meters, Instruments, Regulating Devices. Plastics will be used to a greater degree by most manufacturers.

Power Specialties, Bus Hardware, Switches. Manufacturers cannot approximate the degree to which light metals and composite wood will be used.

Porcelain Insulators. Experimental work using plastics in insulator manufacture has been limited.

Overhead Line Specialties, Hardware, Fuses, Cutouts. The newer light metals and plastics will be used by some manufacturers in the post war period.

Underground Specialties, Materials and Fittings. The light metals and newer materials are expected to find wider applications as time goes on.

Industrial Equipment, Wiring Devices, Panelboards, Ducts, Fittings. About one half of the industrial equipment manufacturers state that plastics, new light metals and composite woods will have little or no immediate effect on their particular products. Several in the remaining half expects changes due to light metals, particularly aluminum.

Industrial Control Equipment. Expect to use some of the new materials wherever costs can be cut.

Motors. Very little of the lighter metals or plastics will be used in the immediate post war period. Later the lighter metals may find a use in motor construction.

Industrial Heating Equipment. Manufacturers expect that industrial heating equipment will be unaffected by the newer materials.

Lighting Equipment. By more than a two to one division manufacturers feel that light metals, aluminum particularly, and plastics will be more important in the manufacture of lighting equipment.

Appliances. Several manufacturers expect to use light metals to a limited degree.

STANDARDIZATION

Will attempt be made to cater to the market by having available many types and sizes?

Or will simplification of the line of products be the aim?

▶ *Most manufacturers would like to simplify their lines and a great many will try to, but one gets the feeling that the customer will make the decision. Whatever he wants he can have. In some lines, like lighting equipment, the buyer will have a wider line from which to choose.*

Boilers. Standardization is the aim, but if buyers insist, they can have that for which they are willing to pay.

Pumps, Condensers, Compressors. Manufacturers would like to reduce design and size variations and that will be possible in some lines, but the customers' preferences and desires will prevail, as usual.

Turbo-Generators. Results of efforts now being made to establish preferred sizes and characteristics will determine whether or not lines will be simplified. Simplification is desirable but may not be feasible.

Oil and Air Circuit Breakers, Switchgear. Fewer sizes and types being tried for.

Transformers, Power and Distribution, Regulators. Manufacturers will supply that for which the customers will pay, although strong effort will be made to standardize and simplify lines in which volume production is possible.

Capacitors. No great problem as to sizes and types.

Wire, Cable, Conductor Materials. Many products in this group are manufactured on order and will continue to be according to customers' specifications as before. Will encourage simplification as it appears practical.

Meters, Instruments, Regulating Devices. Watt-hour meters well standardized now. Wide diversity in applications of indicating, recording and control instruments offers little hope for simplification of lines. Probably more can be done in standardization of parts of instrument assemblies.

Power Specialties, Bus Hardware, Switches. Attempt will be made to standardize items and simplify lines.

Porcelain Insulators. Pre-war types and sizes will continue seems to be the general opinion.

Overhead Line Specialties, Hardware, Fuses, Cutouts. Replies indicate that manufacturers would like to prevent enlargements of lines resulting from customers' demands for special types and sizes. But the feeling exists that it will be difficult, in some cases undesirable, to do so.

Underground Equipment, Materials and Fittings. Every attempt will be made to simplify lines for volume production.

Industrial Equipment and Wiring Devices, Panelboards, Ducts, Fittings. There appears to be a general disposition to meet the wishes of buyers without much regard to simplification of product lines.

Industrial Control Equipment. In standard-product lines effort will be made to hold variety under control, but it is recognized that specialized applications will require specialized products.

Motors. The general-purpose, integral-hp. motor line is well established and no departures from it are foreseen. Fractional-hp. motors, however, offer opportunity for economy in standardization and effort will be made towards that end.

Industrial Heating Equipment. As requirements of users call for special types and sizes they will be met.

Lighting Equipment. There will probably be a wider range of types and sizes than before the war because buyers' demands will be more diverse. However, there will be strong efforts made to realize the economies of volume production. A few indicate that orders for specials will not be accepted.

Appliances. Fewer types and sizes will be available post-war. Demands will be large, and large volume production which excludes specials will be necessary.

To what extent, by inducements as to price or delivery or otherwise, will the purchase of a standardized line of products be encouraged?

▶ *While admitting that standardization will result in improved deliveries and price concessions, very few manufacturers are willing to indicate how much. Where lines have some large degree of standardization little effect was foreseen. The appliance group suggested that specials ought to be discouraged by quoting longer deliveries and higher prices.*

Boilers. Standardization should make a difference in price.

Pumps, Condensers, Compressors. Tendency toward standardization will allow more rapid delivery. Some manufacturers estimate this tendency will lower costs as much as 25 percent.

Turbo-Generators. Determination of preferred sizes and heat balance characteristics will have a considerable bearing on turbine standardization. This will also allow better delivery and price considerations.

Oil and Air Circuit Breakers, Switchgear. Better price and delivery.

Transformers, Power & Distribution, Regulators. Approximately 80 percent of the manufacturers state that standardization will make some difference in delivery time and make some price concessions.

Capacitors. A standard line of capacitors would tend to allow better deliveries, lower price, and more detailed data to the sales forces.

Wire, Cable, Conductor Materials. Most manufacturers do not see much to be gained by stressing purchase of standardized conductor materials. Price and delivery would not be affected but some feel a better grade of finished product would result.

Meters, Instruments, Regulating Devices. Some effect would be felt in meters and instruments by better delivery, quality and service.

Power Specialties. Standardization should effect delivery and price.

Porcelain Insulators. It is expected that some price considerations could be offered by standardization.

Overhead Line Specialties, Hardware, Fuses and Cutouts. Coordinated work with the utilities should prevent a lot of specials which will result in better deliveries at lower costs.

Underground Specialties, Materials and Fittings. There will be a differential in price and delivery which will cause the purchasing agent to question the "specials."

Industrial Electric Equipment, Wiring Devices, Panelboards, Ducts, Fittings. At the present time standardization does not appear to have much to offer toward purchase inducements.

Industrial Control Equipment. Standardization will allow a slightly shorter delivery time. Customer would get the benefit of price differential, if any, on standard item over special item.

Motors. Standardization will be encouraged because of the shorter shipments possible. Price inducements will depend on the economics of the situation.

Industrial Heating Equipment. Quality, price and shipment will be used to encourage standardization.

Lighting Equipment. There will be little if any additional sales inducements offered by a standardized line. Some manufacturers will accept orders only on regular items.

Appliances. Manufacturers will feature a simplified line at a lower price. Specials will be discouraged by price and long delivery.

GENERAL COMMENTS

► *Several manufacturers in reporting added some additional information to that previously detailed which it is not possible to summarize except to say that the producers in general expect a good post-war market. They foresee a great many difficulties of which customers should be aware.*

Pumps, Condensers, Compressors. Shortage of younger engineers will hamper developments immediately following the war. Government employed lawyers will leave for municipal positions taking their "hard boiled" contract habits with them. This will tend to make municipal business more difficult. Indications are apparent that the rotating pump will become stronger at the expense of the reciprocating pump.

Turbo-Generators. The conversion problem of the turbo-generator manufacturers is not a particularly serious one; it is more one of rearrangement. Instead of making marine equipment production will be resumed on steam apparatus for commercial and industrial application.

Oil and Air Circuit Breakers, Switchgear. Expect business to be good due to the overloading of electrical systems. Considerable replacement and revamping necessary to meet shifts in load centers.

Transformers, Power & Distribution, Regulators. The utilities can look for more improvements in protective devices and developments that will reduce maintenance. An increased demand for unit substations is expected after the war.

Capacitors. Expect trend will be to more individual industrial application of capacitors to bring the plant power factor to 95 percent. Each device may be equipped with a capacitor. Manufacturers also expect the utilities to add capacitors to the distribution system to increase the effective capacity of the system.

Wire, Cable, Conductor Materials. Natural rubber is preferred to synthetic substitutes by some manufacturers. One manufacturer expects government buying in the post war era to be a big factor. Maintenance requirements of new navy, large army and air force is expected to require large quantities of cable. Studies are being made of production methods in the light of new ideas acquired during the war period.

Meters, Instruments & Regulating Devices. Expect labor difficulties immediately following the war because of a sharp decline in war production. Every attempt will be made to get back to war volume by developing new markets and new products.

There is some thought that the manufacturers of watt hour meters may be in the opposite position, not being able to produce meters fast enough.

Power Specialties, Bus Hardware, Switches. There are indications that customer research is going on to find ideas for new products and improvements in the old.

Overhead Line Specialties, Hardware, Fuses, Cutouts. Cutouts are expected to be cheaper and better than pre-war models. Some indications that overhead line construction will lose out somewhat to underground.

Underground Specialties, Materials and Fittings. See brief period of fair activity immediately following the war, followed by quite some hesitation on the part of business. The length of this hesitation will depend upon the smoothness of conversion to peace economy.

Industrial Equipment, Wiring Devices, Panelboards, Ducts, Fittings. Better production control has resulted from the distasteful paper work, urgent demand for quicker manufacture, better scheduling and higher precision in manufacture. There is said to be a real need for standardization of wiring devices; simple as they appear to be.

Industrial Control Equipment. Expect continuation of large orders if automobile and similar industries are allowed to convert to civilian production at an early date. Tremendous interest is being shown in foreign markets. One of the serious problems facing the control manufacturer is the abnormally large amount of money tied up in materials in process. In some instances this is as high as 400 percent above the normal figure. To be left with this huge inventory of partially finished goods against which material, labor and overhead have been charged would jeopardize the financial standing of these concerns.

Motors. Expect a good postwar appliance-motor market for approximately two years, then a slump.

Lighting Equipment. Expect filament and fluorescent lighting to divide the commercial market about evenly. High labor cost will undoubtedly continue. Rather limited early postwar market for home fluorescent lighting is expected except in kitchens where concealed sources may be easily had. New advances are expected in street lighting and other outdoor illumination.

Appliances. First concern at the moment when considering price is O.P.O. ceiling price. Unless some change in policy occurs permitting manufacturer to charge prices sufficient to cover increased cost of labor, material, reconversion costs, together with reasonable profits; production of new goods and possibly old goods (prewar models) may be seriously delayed.

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Proposed Requirements for Power Transformers

Mechanical details indicated by experience of utility to be desirable items to incorporate in standards and specifications for power and network transformers—Accessories also discussed

J. A. RAWLS, Construction Engineer, Virginia Electric & Power Co.

THE DOBLE ENGINEERING COMPANY'S Client Committee on Transformers, of which the author is a member, has been considering possible standard requirements to be incorporated in specifications when ordering new transformers. From experiences on the system of the Virginia Electric and Power Company, a list of features which we believe desirable has been prepared. Some of the features are already definite requirements in our purchase specifications, but many of them are proposed for post-war use and are not included at the present time.

Corrosion Prevention

Trouble has been experienced due to rusting of the bottom of power and network transformers. It appears desirable for the manufacturer to supply special treatment on the bottoms of transformers, particularly the network and subway type to prevent rusting. This treatment should cover all surfaces that cannot be reached for painting. Metal spraying of zinc and lead on these bottoms may eliminate rusting and make expensive paint jobs unnecessary.

It has been found that the conservator construction on power transformer formers is very satisfactory from oil preservation viewpoint. We have, however, experienced trouble from rusting in the main conservator tank, as well as in the relief pressure device. The manufacturer has supplied these items for us either bonderized or parkerized as a means of rust prevention. We normally require that conservators be supplied on transformers 501 kva. and larger, single phase, 600 kva. and larger, three phase. A protective cap is required over the pressure relief device on transformers 1,000 kva. and larger, single phase, 1,500 kva. and larger, three phase. A hand-hole at least 8 in. in diameter is required on the top of all conservators to facilitate cleaning.

Breathers and Diaphragms

Silica-jel or activated alumina breathers are required on transformers with conservator tanks. On transformers that do not have conservators and are not completely sealed, two breathers located on opposite sides of the tank are required so as to give uni-directional air flow. Breathers shall not be located on the top of conservators or transformer tanks, but shall be located so that snow cannot build up around them and rain water cannot hit the tank and bounce into them.

We have experienced trouble with synthetic relief diaphragms, and glass appears to be the best material provided the metal surfaces are properly machined and the proper gaskets are used with it. The corprene gasket has been found to be unsatisfactory with the glass diaphragm and cork to be very satisfactory. The protective cap over the pressure relief device protects the cork gasket from the weather, and also keeps water out of the relief pipe after a diaphragm is broken.

Conservators and Drains

A goose neck connection is required between the conservator and the main transformer tank with a valve in this connection so that work can be done on the conservator if necessary while the transformer remains in service. We are installing these goose neck connections and valves on old transformers that were not equipped with them. In case the transformer is flooded by water, the valve in the goose neck connection can be closed to keep water out of the transformer.

A sump with drain valves should be supplied in the bottom of all conservator tanks. It is also desirable to have the conservator tank slightly lower on the end with the sump so that water collecting in the bottom of the tank will readily flow to the sump.

Gasket retainers and metal to metal stops are required for all gasketed joints.

Filter Press Connections

One and one-quarter inch valves for filter press connections are required, one at the top and one at the bottom of the transformer. On larger transformers, the oil drain valve which removes oil from the lowest part of the tank shall be independent of the filter press valve. A small oil sampling valve of either the gate or globe type shall be installed so as to remove oil from the lowest part of the tank also.

It will probably be desirable to install the oil sampling valve as a part of, and on the outside of, the main drain valve. The main drain valve can be plugged or capped and when it is necessary to take an oil sample, the big valve can be cracked before opening the sampling valve. With the small valve installed at this location, it will be very easy to repair it should it leak or become damaged without removing oil from the main transfer tank. With the small sampling valve located directly onto the main transformer tank, it is very easily struck and damaged.

The voltage ratio adjuster operating handle should be brought out through the side of the transformer tank. This allows taps to be changed quickly with safety to the operator without requiring the grounding of the transformer leads.

Gauges and Thermometers

Magnetic type oil gauges should be supplied on all transformers 100 kva. and larger, 33 kv. and above and on 500 kva. and larger, at lower voltages. On transformers 1,667 kva. and larger, single phase, and 3,000 kva. and larger, three phase, the magnetic oil level indicator should have contacts incorporated in them which can be used to sound an alarm when the oil is low in the transformer tank or conservator. We have installed the Magnetrol alarm device for this purpose in several transformers recently, but feel that the combination oil gauge and alarm is satisfactory. We have made it a practice for the past several years to install magnetic oil gauges on transformers whenever we were doing maintenance work on them.

For all thermometers and fan controls from oil temperature we require that the thermal wells shall be integrally welded to the tank so that the bulbs can be removed without lowering the oil in the tank. Thermal wells are required for future additions of fan control on transformers 1,000 kva. and above, single phase, and 1,500 kva. and above, three phase. These wells are found to be essential in order that the thermometers can be removed and properly calibrated.

Dial type thermometers are required on transformers 100 kva. and larger, 33 kv. and above, and 250 kva. and larger, under 33 kv. These thermometers should have maximum reset handle through the cover and alarm contacts shall be supplied where the thermometer is to go into a transformer 1,000 kva. or larger.

Mercury column thermometers are required in addition to the dial type thermometer on transformers 5,000 kva. and larger for voltages under 33 kv., and 2,000 kva. and larger, 33 kv. and above. The thermal well for this thermometer shall be supplied on all units 2,000 kva. and larger. The face of the thermometers can be mounted vertical where the mounting height is not above eight feet from the bottom of the transformer. When the mounting height of the thermometer is above eight feet from the base of the transformer, the face of the thermometer shall be tipped forward at an angle of 30 deg. All thermometers shall be mounted at the thermal well without long tubes running from the well to the instrument. We have experienced so much trouble with thermometer connecting tubes on transformers that we have removed prac-

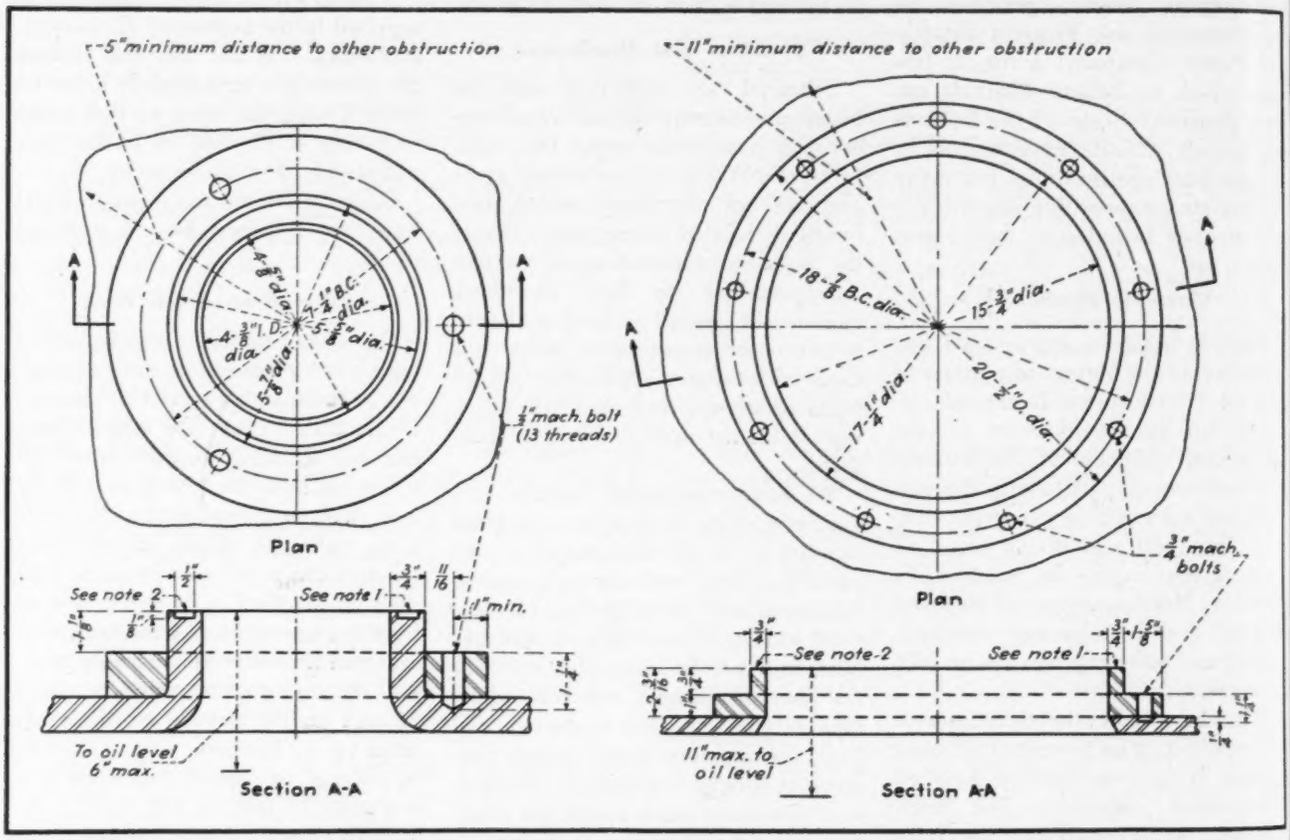


FIG. 1—Opening detail in equipment for 8.7, 15, 25 and 34.5-kv. bushings. Notes: 1. This lip to be so located above core, terminal board or other parts of the transformer that a bushing with a dimension of 26 in. from the mounting flange to the lower end of the bushing terminal can be used with adequate clearance. 2. Gasket to fit between lip and bushing or bushing adapter to be 4¾ in. in diameter and 5½-in. O.D. cork gasket to be ¼-in. thick and corprene gasket $\frac{1}{16}$-in. thick. 3. Oil level in equipment to be max. of 6 in. below top of bushing opening. This dimension may be altered with purchaser's permission

FIG. 2—Opening detail in equipment for 115-kv. bushing. Notes: 1. This lip to be so located above core, terminal board or other parts of the transformer that a bushing with a dimension of 4 ft. from the mounting flange to the lower end of the bushing terminal can be used with adequate clearance. 2. Gasket to fit between lip and bushing or bushing adapter to be 15½ in. inside diameter and 17½ in. outside diameter cork ¼ in. or corprene $\frac{1}{16}$ in. thick. 3. Oil level in equipment to be max. of 11 in. below top of bushing opening. This dimension may be altered with purchaser's permission

tically all of them from existing transformers on our system.

If the dial type thermometers are improved so that they will not have to be calibrated oftener than once every three years, the mercury column thermometer with its well will not be required by us.

Drawings and Tests

The following certified drawings and test reports are required on all transformers having a primary voltage of 33 kv. and above, and on all transformers above 100-kva. capacity below 33 kv.:

(1) Diagrammatic name plate drawing.

(2) Outline dimension drawing.

(3) Copy of certified test report including power factor tests on windings and bushings. The power factor for the windings shall not exceed 2 percent at the present time. We do not specify what the maximum power factor of the bushings shall run, but normally require that it be less than 2 percent for liquid-filled bushings. The power factor values required on windings and bushings may be changed by us if satisfactory insulating materials cause this value to change.

(4) Heat run tests are occasionally required, but generally the results of heat run tests which have been made on similar units will take care of our needs.

(5) Detail drawings for all bushings required on all transformers 33 kv. and above and on all transformers above 100 kva. in the lower voltage class.

Bushings

Liquid-filled bushings shall be supplied on all voltages 33 kv. and above, as well as on transformer units 1,000 kva. and above in the 15 kv. class. Bushing openings in transformers to be in accordance with Fig. 1 for all bushings in the 8.7—15—25—34.5 kv. classes. Bushing openings to be in accordance with Fig. 2 in the 115 kv. class. Due to trouble that has been experienced with corona even in the 15 kv. class it might be wise for the manufacturers to consider treating the inside of bushing tubes with conducting paint or glaze. It has been noticed that one manufacturer is doing this on his 15 kv. dry type bushings. Clamp type terminals shall be supplied externally on tops of all bushings on power transformers. We have considered clamp type terminals for use on the inside of bushings and the Burndy Company has made up drawings covering these clamp type terminals.

All joints in windings or at bushings shall be either the brazed or clamped type—solder connections are not permitted.

Mechanical Details

Steel or cast steel wheels of the broad flange type at least 8-in. in diameter shall be supplied on the following transformers:

1,000 kva. and larger, single phase,
1,500 kva. and larger, three phase in the 115-kv. class, and
1,667 kva. and larger, single phase and
2,500 kva. and larger, three phase under the 115-kv. class.

All radiators are to be attached with valves on units 1,000 kva. and larger in the 115-kv. class, and 3,333 kva. and larger for voltage classes below 115 kv.

On all transformers 1,000 kva. and above complete provisions shall be made so that cooling fans can be added at a later date without drilling or welding the transformers.

Hot spot winding temperature indicators are required in special cases only.

On three-phase transformers, the neutral is to be brought out through reduced voltage bushing and not grounded to transformer case.

Transformer tanks shall be capable of vacuum drying in the field without having to brace the tanks.

Tanking guides for the centering of core and coils required on units 500 kva. and larger. This feature greatly facilitates the tanking of core and coils in the field.

Locknut provisions required on all inside bolted connections. (Palnut very satisfactory.)

Jack bosses and lifting eyes required on all units 500 kva. and larger.

Taps, Floor Space, Leads

Standard voltages or taps have not been set up, but we normally require 4—2½ percent tap range which is usually located on the high voltage side. The impedance required is normally 5 percent in voltages 34.5 kv. and below and from 8 to 10 percent in the 115-kv. class. When transformers are purchased to bank with existing units, we specify an impedance for proper operation in the bank unless the impedances of the existing transformers are too far outside of accepted impedance standards; in which case, external impedance is provided.

The above thoughts include no comments on welded tank construction or inert air type of transformers. The fact that we do not mention these units does not mean that we are not interested in them. We are very much interested in them for use as subway transformers and probably in the small power transformer class. Whenever a completely sealed unit is supplied, a connection should be furnished so that the pressure-vacuum gauge can be used if necessary.

In general the floor space required by a power transformer should be square. In some cases it may be necessary to alter the shape to fit in with the existing space requirements.

The size of transformer leads to the bushings should be shown on the outline drawing. This helps in determining the emergency overloads that can be carried on transformers.

FM Emergency Equipment Popular

That comprehensive two-way radio communication in the utility industry will undoubtedly become one of the "musts" in every forward looking program was stated recently at the Southeastern Electric Exchange by D. Lee Chesnut of General Electric Co. Communication is now based on the 30-40 megacycle band supplemented by 116-119 megacycle band for automatic repeater units.

The rapid turn to FM is obvious when looking over the record of installations in emergency communication since late 1940. Approximately 75 percent of the 429 installed transmitters in this group are used by public utilities and urban transit companies. This represents the total accumulation of installed units since the beginning of this work, and it is natural that the majority should be of the AM variety—actually 71 percent medium-frequency AM, 7 percent 30 to 40 Mc. AM, and 22 percent 30 to 40 Mc. FM.

Of the approximately 900 mobile transmitters in service, there are already 56 percent FM, 30 percent 30 to 40 Mc. AM. and only 14 percent medium frequency AM.

Repairing an Oil-filled Submarine Cable

Three-conductor 27-kv. cable raised with slings attached by diver — Oil leak located by bubbles — Sheath repair made on platform erected near river bank

C. T. HATCHER, Acting Division Engineer, Consolidated Edison Co. of New York, Inc.

SUBMARINE CABLES are normally installed from five to ten feet below the bottom of navigable bodies of water for protection from anchors, floating objects, or material dropped from the water's surface. For cables operating at 15,000 volts or higher it is customary to use paper insulation for the dielectric. Until recent years the majority of cables for submarine use have been solid type, paper insulated, lead covered cables.

Experience has indicated that lead sheath of a cable may open up after it has been installed due to initial inherent defects in the sheath, damage during installation, or damage after installation. When the sheath opens on submarine cable it is quite possible that water will be admitted resulting in electrical failure of the cable.

A cable of the oil-filled type provides an internal positive pressure which causes a flow of oil outward when a break occurs in the sheath and thereby prevents admittance of water. The advantages of this type of cable for submarine installation were demonstrated recently when it was found possible to pick up a cable, repair a break in the lead sheath, and restore the cable to its original position in the trench.

Installation

Three-conductor, 27,000-volt, 500 Mcm paper-insulated, oil-filled, lead sheath, steel-wire-armored cables were installed from one of our generating stations across a river. The cables were approximately 3,000 feet in length and were installed in a trench prepared in the river bed (Fig. 1). Feeding type or gravity reservoirs were installed at the generating station end and each cable was supplied with its individual reservoirs.

Shortly after the cable had been installed and before back-filling had been placed in the trench, the reservoirs supplying one of the cables showed a steady loss of oil at the rate of approximately one gallon every six hours. Examination revealed bubbles of oil rising to the surface of the water and a considerable quantity of oil and tar floating on the surface of the water in the pocket at the bulkhead indicated at point "A" in Figs. 1 and 2. Arrangements were made with a marine contractor to supply equipment and a diver to raise the cable in order to inspect and repair it. The diver went down and attached rope slings. A power derrick raised the cable and a cantilevered platform (Fig. 3) was constructed from the shore.

Cable Examination

In order to ascertain the extent of any possible damage beneath the sheath, a cut was made on the top side of the cable six inches long, parallel to the axis of the cable. Circumferential cuts were made halfway around the cable so that the piece of lead could be bent down, exposing the insulated conductors. Examination showed that the conductors had not been damaged and that a satisfactory repair could be made by bending the sheath back into position and lead burning the cuts and break. This procedure was followed, the lead burning being started at the bottom of the circumferential cuts and finished in the longitudinal cut on the top of the cable, thus preventing any gas from being trapped inside the cable.

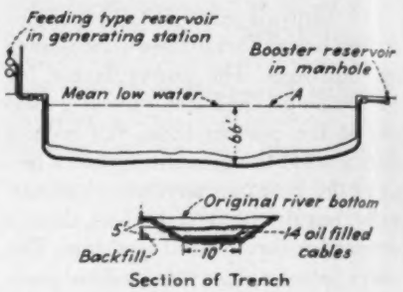


FIG. 1 One of 14 cables in a trench across an inlet some 3,000 ft. wide started to leak oil at point A

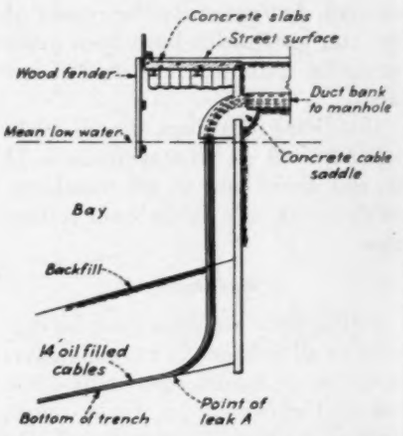


FIG. 2 From direction of rise of oil bubbles it appeared that break in cable sheath was in vertical portion where the cable rises to the street duct entrance

To protect the cable at the point where the armor strands had been cut, a cushion was built up consisting chiefly of alternate layers of ratline, thoroughly tarred, and anhydrous tape. The sheath was first protected with a coat of black plastic compound. Next, a layer of anhydrous

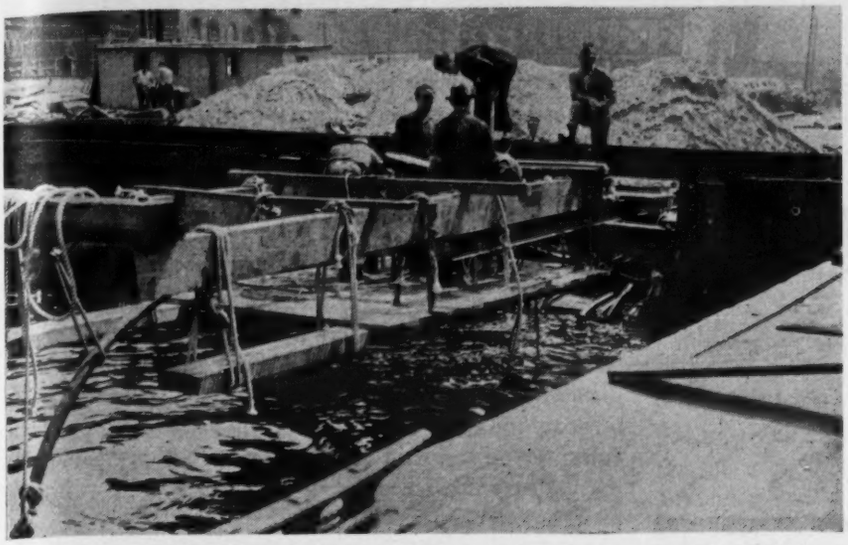


FIG. 3 Cable position during repair operations; taken prior to removal of platform flooring to permit lowering repaired cable into the water

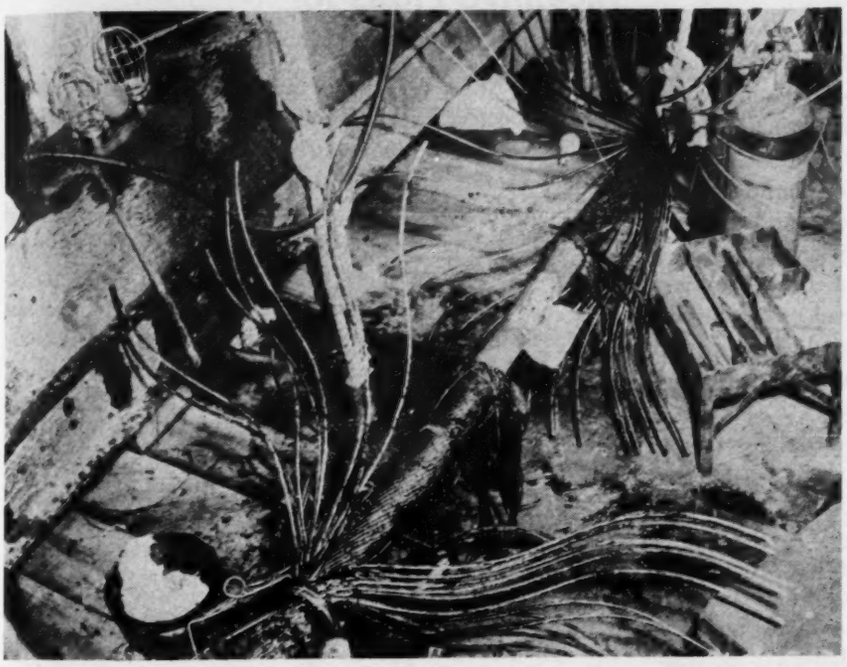


FIG. 4 Steel wire armor laid back and jute removed to expose break in lead sheath

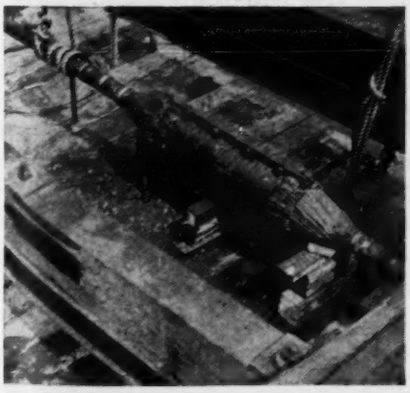


FIG. 5 Repair completed. Over built-up 7-in. diameter insulating sleeve two-piece steel casing was bolted together. On tapered cones at ends of sleeve the armor wires were laid up and snubbed

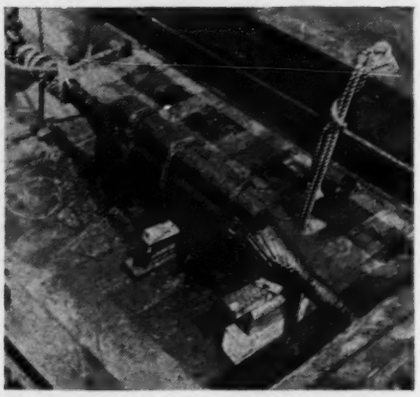


FIG. 6 Wood blocks placed to cover flanges and bolts so as to prevent damage to other cables from sharp edges. Entire casing given heavy coating of compound to re ard deterioration

tape half-lapped, followed by a layer of tarred marline, after which the ratline and anhydrous tape layers were built up to a diameter of approximately seven inches and a length of 30 inches. Over this was placed a split steel sleeve, the two halves of which were bolted together (Fig. 5). Tapered cones at the ends of the sleeve reduced the seven-inch diameter to the diameter of the cable sheath in a distance of approximately eight inches. The armor strands were then laid up these tapered end sections and anchored to the steel casing. Wood blocks were added (Fig. 6) and the entire casing was then given a heavy coating of compound to retard deterioration.

Upon completion of the repair the loss of oil was found to have been stopped and the submarine cable was satisfactory for service because no water had been admitted. By a relatively small expenditure of money a very costly cable had been saved.

FIG. 7 Platform flooring removed preparatory to lowering cable back into underwater trench with other cables

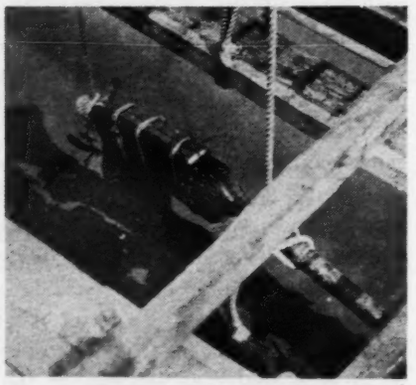


FIG. 8 Repaired cable entering the water. Diver below guided the cable so that it lay in straight line to the foot of the sheet steel piling and up to the surface

Editorials

S. B. WILLIAMS, *Editor*

Power Pool Marketing of Government Generated Power

WITHIN a few weeks the country will be in the midst of a presidential campaign in which the issue will be mainly post-war activities. Regardless of which candidate wins it is reasonably certain that federal waterway improvements involving power generation will be undertaken. Both leading candidates for the nomination, for instance, have gone on record as favoring the St. Lawrence seaway. The only difference is that an administration elected on a platform of taking government out of business could be expected to place the responsibility for distributing government generated power in the hands of business.

That raises the question of the responsibility of companies outside the immediate area to help market the power from any particular project. Can a company be an isolationist under such a situation and sit idly by watching its neighbor struggle to digest the extra generation?

Even a wholly friendly administration will expect the power companies to market the government power quickly and will be impatient with any delay. There will be some instances, however, where the company or companies immediately affected will find it extremely difficult to handle such large blocks of power unaided, particularly if they have large surpluses of capacity of their own left over from serving war load. Under those conditions neighboring companies must pitch in and carry part of the burden.

Since these improvements are being projected for nearly every section of the country it means that regional power pools will be of major importance after the war. In that way huge blocks of power can be absorbed more quickly without pinching any single company.

And if such a procedure will be effective with future government projects, may it not also be used to help market post-war surpluses from some present projects? Some of them in different sections of the country have been pretty well occupied with war load during the past two or three years, but when peace comes they will again be looking for an outlet. If the utilities cannot provide them with some relief then the possibility of a resumption of the old battle for territory will arise once more. And since the outcome is generally the loss of territory, as well as bad publicity, it might be worth while taking some if not all of that surplus, even though there was enough surplus back home to be worrisome.

If any suggestion of that kind is made to the government power administrators, it should be on a basis that is fair so that, if turned down, the public power people will be at a disadvantage in any territory invasion efforts.

While to many people the idea at first glance will be distasteful, careful consideration might reveal it as an opportunity to demonstrate the effectiveness of private enterprise in the field of energy distribution—something the industry has asked for in the past but never with any great amount of success.

Incentive Plans for Rate Adjustments

THREE WEEKS AGO at the annual meeting of the Southeastern Electric Exchange, the chairman of the Georgia Public Service Commission stated that the conference method of rate adjustment when properly operated was better for the utilities and more in the public interest than the sliding scale method. There are many utility people who will go along with this point of view, but at the same time there has been a very great interest expressed in the New Jersey plan, described in this issue, which is the latest adaptation of the sliding scale method.

Whether one or the other is better we will leave to experts. The fact remains, however, that both the investors and consumer interests are best served when management has some incentive to be more efficient. The fear incentive has been a powerful factor in driving rates down for some time, but that isn't healthy and cannot continue for long.

Where the investor and labor share with the consumer the benefits of improved operation there is the proper encouragement to seek out more efficient methods in every branch of the business. The customer gains not only in lower cost service but under the stimulus of a greater return there will be more desire to extend and increase service.

One of the greatest weaknesses of regulation has been its failure to provide a reasonably foolproof method of rewarding efficiency. It isn't enough that commissions and companies can work together with confidence and respect. The public also must understand what is being done and have confidence in the outcome.

Regardless of whether rate adjustments are made by the sliding scale route or through conference, the public confidence in the procedure must be won. The commissions have been remiss in not giving more publicity to their work and the utilities under their jurisdiction have been equally at fault for not telling their customers more about regulation. If there is any public apathy toward

utility regulation or any mistrust, it is because the public is uninformed. This is something that must be corrected before any method of rate adjustment will have public acceptance and be free of suspicion.

Time to Start Telling Dealers About Objectives

AN EXECUTIVE of one of the prominent electrical appliance manufacturers recently suggested that perhaps the utilities, in spite of all their talk in favor of dealer coordination, had a great many mental reservations on that score. It is true that of those who were actively merchandising appliances for sale in their own stores before the war, only a small number have decided to turn the business over to the dealers lock, stock and barrel. That doesn't mean, however, that the companies are any less interested in dealer sales. In fact there is every indication that more encouragement will be given to the dealers than ever before.

In most places the utilities all during the war have sought in many ways to help the dealers stay in business. Surely they would not have gone to all that trouble to save their dealers if they had any intention of leaving them to their own devices after the war.

However, if the utilities, in reaching the decision to become more aggressive in their own selling efforts, have left the impression that they have any serious reservations on dealer coordination, it should be corrected quickly. Dealers will be needed more after the war than ever before in order to build residential load quickly. Properly handled, there need be no conflict between aggressive utility merchandising and healthy dealer operations. In fact, the one can help the other. So, in order to forestall any possible mistrust and at the same time to lay the groundwork for the greater coordination that is going to be needed, it might be smart for the utilities to start telling the dealers some of their plans and show them what it means to all to reach the objectives.

Simplification Program Not Sticking

A GREAT MANY PEOPLE have been hoping that the limitation orders on sizes, types and styles of electrical products might have some lasting effect after the war. The resume in this issue of the current thinking of electrical manufacturers indicates that if anything there will be more variations to choose from than formerly, for despite the fact that some slow moving items will have been dropped a number of new designs will be added just as soon as materials and labor are available. The manufacturers are taking the attitude that anything the buyer wants he can have it if it can be made.

This attitude undoubtedly will have some slowing down effect upon the trend toward standardized products, regardless of the fact that most manufacturers see lower prices resulting from repetitive production.

After the pendulum has swung back far enough the manufacturers will remember the increased output that came from the buying of a simplified and standardized line and then they will make a real serious effort to sell it. Until that time most manufacturers are interested only in getting their regular customers back and will place no limitations in their way.

Buyers, on the other hand, might be expected to be a little more mindful of the effect of individualism on their inventories and hold down to a smaller number of styles and sizes. They already know that by so doing they can materially reduce inventories and all of the costs that go with stocking and purchasing. If there is any considerable amount of such self-imposed limitations the manufacturers will undoubtedly be more inclined to get on the bandwagon.

Output Curve Reflecting Reduced Industrial Usage

FOR THE FIRST TIME in years the national weekly kilowatt-hour output curve failed to show a marked upswing by the first week in May. This year instead the curve took a sharp nose dive.

Also, the difference between the peak month last December and the low this spring is the largest in amount ever registered and more in percentage than any previous war year. This year the difference was 390 million kw.-hr., or 8.4 percent. Last year it was less than 3 percent and the year before was under 6 percent. The last non-war year the differential was just under 10 percent.

While the output continues to exceed last year each week, the difference gets smaller and at the present rate of convergence the two curves should come together long before the end of the year. Already the Rocky Mountain area has been below last year for several weeks, and last week New England for the first time went below the comparable week of last year.

Because of the stability of the residential and commercial usage at this time, these figures are probably the most sensitive national barometer of industrial activity and, for that reason, should also be a fairly good indication of employment conditions.

On the basis of these data it would not be unreasonable then to expect even greater resumption of civilian production than that already announced. Already there has been a reversal of the position taken early in January when the armed forces objected to the WPB program for taking up employment slack and, if the trend indicated by the output curve continues, a more widespread easing up in production restrictions might be expected. Coming events will cast their shadows before them in the output curve.

WASHINGTON COMMENT

By R. N. LARKIN, Washington Correspondent

Repeal of Wartime Harmful to Farmers

IT IS IRONIC that Congress' vendetta against Wartime, pushed principally by rural interests, might never have arisen had the war brought a sufficiently serious power shortage to have required rationing.

It is equally ironic that repeal of Wartime would, if accomplished, hit many farmers harder than city dwellers.

The power industry does not disparage the difficulties imposed on farmers by Wartime. But it is evident that during the two summers since Wartime became national policy, these farmers have produced at levels hitherto unapproached. That Wartime has inconvenienced this production is inescapable, but it has not prevented it. Any assumption that failure to abrogate Wartime immediately will ruin this year's production just will not stand up. This is not to argue that farmers should be saddled with difficulties which can be relieved without otherwise hurting the war, but no inconvenience whose removal would create an even more imposing problem should be wiped off the books merely for political reasons.

Where Wartime Saves

The House subcommittee considering repeal believes that Wartime is a boon in some metropolitan sections and a curse in all others. This does not stand up.

Obviously, Wartime saves most in the most heavily populated areas. By turning the clock ahead, it gets commercial and single-shift industrial loads off the lines earlier than by sun time. Then, also in the late afternoon, it holds down the effect of the domestic use of electricity, which is usually highest during the preparation of the evening meal. Thus, the evening peak demand for kilowatts of generating capacity is minimized, and the lower the peak,the less generating capacity is required. The increase which Wartime causes in early morning consumption is not only smaller than the evening savings, but it also comes at a relatively off-peak period.

Capacity savings due to Wartime are estimated to exceed 1,600,000 kw. This averages about 45 watts per family if 3.5 persons per family be a fair figure. A review of the electric power industry's operating statistics of the last year will show that average or above-average savings were realized through Wartime in New England, the Middle Atlantic states, some southeastern states, most of the midwest from Canada to the Gulf and the entire Pacific Coast. Mountain and Great Plains states as well as most of the Southeast show savings which, while below average, are considerable.

Smart Plants Suffer Most

Actually, if Wartime be repealed, some of the customers of small midwestern municipal plants will suffer most. Many of these plants are not interconnected, thus have only their own facilities for standby. Their load growth during the war has been met, in general, through Wartime savings. The relatively small turbines and generators they would need to meet repeal are the most scarce, and thus would be the hardest to supply. In many systems, much of this load growth is in rural electrification loads connected during the war. In such cases, the framer who eased his position by junking Wartime would, at the same time, complicate it by overtaxing his energy source.

In view of all this, Congressmen who think they are freeing the farmer of an unbearable burden imposed on him for the sake of a few heavily populated areas should think again.

Beyond the generating capacity question, which is probably the most serious, there are the matters of distribution capacity and fuel. Not every distribution system by any means would need extensive revamping if Wartime were repealed. But some would, and on these systems, dependable service would be available only when such system enlargement and reinforcement had been done. This would entail larger transformers and more of them, and other items.

Since there can be manufactured only so much distribution equipment, and since a number of these items are now critically scarce, it is apparent that rural electrification, which has helped the farmer attain his tremendous goals of the last two years, could easily be curtailed or halted until such system reinforcement as the repeal of Wartime would necessitate had been completed.

Effect of Coal Shortage

There is in the making right now a shortage of bituminous coal, the principal fuel whence electric energy is generated, which could reach 40,000,000 tons in this coal year. The best computations put the added fuel costs of Wartime repeal at 800,000 tons of coal and extra oil equivalent to 200,000 tons of coal. It would hardly be wise to add this burden to the nation's coal requirements in such a year of shortage. These figures are solid despite the fact that 25 percent or more of the nation's energy is hydro during a normal water year.

If the pending invasion seals Germany's doom, the resulting 35 percent war production cutback would free enough generating capacity and fuel to handle the repeal of Wartime without trouble in most places. Certainly the Office of War Utilities and the electric power industry have no interest in extending Wartime beyond the point of actual need, for the companies stand to gain revenue from repeal—if they can carry the added load.

Perhaps when Congress returns after its election-year recess, the problem will have been substantially settled, either by failure of the invasion, which would preclude repeal, or by a German defeat, which would make repeal certain. Congress has nothing to lose by waiting until fall to decide this issue.

NEWS OF THE WEEK

Criminal Action Looms in REA Investigation

Ellis charges "forgery" on exhibit previously put in record concerning himself and Craig—Attacks "power trust" and Electrical World—Committee impounds all relevant documents

The second threat of criminal action entered the Senate investigation of the Rural Electrification Administration last week as Clyde T. Ellis, executive manager on leave of the National Rural Electric Co-operative Association, charged that an exhibit previously put in the record, concerning himself and former REA Deputy Robert B. Craig, is a forgery.

The Committee immediately impounded all relevant documents for a full investigation. Sen. Guy Gillette, Iowa Democrat, said the alleged forgery, if demonstrated to be so, might form the basis for a federal criminal charge against the perpetrator, and added that if it does not bring criminal action, it would be no less serious as evidence of tampering with information given a Senate Committee.

Earlier threat of criminal proceedings was connected with the temporary refusal of presidential aide Jonathan Daniels to testify on matters he claimed encroached on his confidential relations with the Chief Executive. The matter was settled by Daniels' later agreement to testify.

Ellis made the allegation of forgery on his own behalf and that of Craig. The alleged forgery was on a letter written by Craig to his former secretary, Miss Margaret Farrar, after he left REA employ in May, 1943. Included in the letter originally given the Committee and put in the record was the sentence:

"I have been in Washington working on a blockbuster for Clyde."

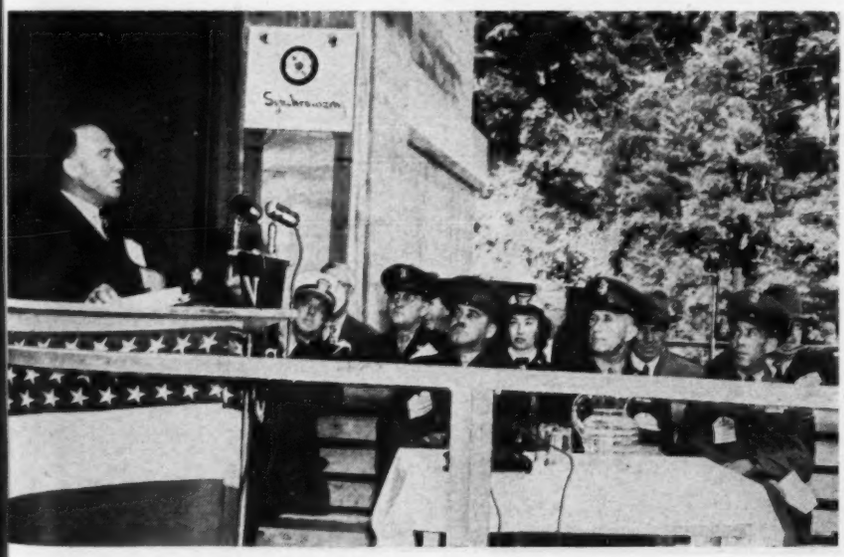
Miss Farrar produced what she termed the original of the letter, photostats of which showed no such sentence, and showed also numerous other discrepancies, even though the form and content of the Committee exhibit and the asserted original were essentially identical.

Highspot of the nine hours Ellis spent on the stand was testimony of a Washington reporter for the St. Louis Post-Dispatch, Edward A. Harris, who testified that Ellis gave him a copy of the "floating memorandum" which circulated widely on Capitol Hill in the spring of 1943, containing bitter attacks on REA Administrator Slattery.

Harris took the stand after counsel Carroll L. Beedy had developed, through Ellis' testimony and documents written by him, that he (Ellis) had never talked with the press relative to his vendetta against Slattery. Ellis denied that he had given the memorandum to Harris.

Beedy also developed that two versions of the "floating memorandum" exist, one containing an extra two paragraphs in which the attacks on Slattery descended to an unprintable level. Beedy attempted to develop that these paragraphs must have been known to Ellis, but Ellis denied emphatically that they were.

Ellis studded his testimony with attacks on "the power trust" and on



AT PLANT DEDICATION—R. E. Fisher, vice-president, Pacific Gas & Electric Co. addressed the distinguished guests, including officers of the Army and Navy from San Francisco, at the recent dedication of the company's new $25,000,000 Pit No. 5 hydroelectric plant (*Electrical World*, May 20, page 12). Mr. Fisher presided at the ceremonies in the absence of President James B. Black, who was ill

ELECTRICAL WORLD, which he termed "the EEI magazine," and which he asserted was "very undependable" on matters concerning rural electrification. The Committee declined to insert in the record scattered news stories and editorials from ELECTRICAL WORLD—which Ellis attacked as "malicious propaganda"—on the basis that REA, not private power companies, is currently under investigation.

Ellis denied much previous testimony which he said reflected on him.

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Irons Production Increased by WPB

WPB has authorized eight more manufacturers to produce an additional 376,768 electric irons, raising the total specifically alloted thus far to 769,338 irons. It announced that it expects all 2,000,000 irons originally authorized will be produced without interruption to the war program. The irons are not expected to reach stores in quantity until fall.

Latest quotas and producers are: Cissell Manufacturing Co., Louisville, Ky., 7,500 irons; Knapp-Monarch Co., Dover, Ohio, 192,000; Metalware Corp., Two Rivers, Wis., 16,500; Reimers Electric Co., West New York, N. J., 2,100; Rutenbar Electric Co., Marion, Ohio, 4,600; Verplex Co., Essex, Conn., (for Landers, Frary & Clark, New Britain, Conn.), 97,868; Waverly Tool Co., Sandusky, Ohio, (for Titeflex, Inc., Newark, N. J.), 31,200, and Winsted Hardware Manufacturing Co., Winsted, Conn., 25,000.

Stress Public Relations at Wisconsin Meeting

Utilities urged to tell story to public at one-day conference of Wisconsin Utilities Association—State Commission Chairman Peterson recommends expansion of utility advertising program

"Utility advertising programs should be continued and expanded to let the public know the facts."

"We must earn the right to operate the free enterprise system by telling our employees and the public what makes freedom work."

"If the utility industry tells its story to the public, to its employees and to Congress they need have no fear of the future."

These opinions and similar references to the relationship between public education and the future of the utility industry, were expressed by several of the speakers at the one-day conference of the Wisconsin Utilities Association in Milwaukee last week.

Chairman R. W. Peterson, Wisconsin Public Service Commission, while disclaiming any pretense of making recommendations, stated that the industry might well continue and expand its advertising program started about two years ago. "It is bound to bear fruit," he said, pointing to the recent rejection of public ownership in a referendum at Madison, Wis., as a triumph of good public relations. "Where rates are proper and public relations good there is no reason to fear the future," Commissioner Peterson affirmed, urging that the utility industry use public opinion poles and advertising as principal tools in an educational public relations program. Edwin Vennard, Vice-President of the Middle West Service, charged that business men have been negligent in allowing the public to think as it does. Grave misconceptions that exist as to the meanings of public ownership, private ownership, democracy and the functions of government are a serious threat to freedom in this country, Mr. Vennard declared.

Among the Washington "observations" of C. E. Kohlhepp, vice-president of Wisconsin Public Service Co., recently returned from a tour of duty as program director of WPB, were these: "The picture on public ownership of utilities is more optimistic than it ever has been. If the utility industry only will tell its story to the public, to its employees and to Congress it has no reason to fear the bogeyman. The utility industry is the only industry not represented with an active lobby in Washington. Even government agencies have lobbyists working on Capitol Hill every day." Mr. Kolhepp doubted

ASSOCIATION OFFICERS CONFER—With newly-installed President of Wisconsin Utilities Association S. B. Sherman, Wisconsin Gas & Electric Co. (third from left) are new fellow officers (l. to r.): Alfred Gruhl, Wisconsin Electric Power, treasurer; M. H. Montross, Wisconsin Public Service, vice-president, and J. G. Felton, Northern States Power, retiring association president. At extreme right, R. W. Peterson, chairman of the Wisconsin Public Service Commission, as he addressed the luncheon meeting of the conference, urging expansion of utility advertising

AT TECHNICAL SESSION—Among those attending the technical division session of the Wisconsin conference were (l. to r.): J. A. Tyvand, Wisconsin Gas & Electric, retiring chairman of the division; speaker K. B. McEachron, General Electric; A. G. Pergande, Wisconsin Electric Power, new technical division chairman and vice-chairman R. A. Kruger, Wisconsin Public Service

that controls and regulations on business will be cancelled the day peace is signed. "But they will be eliminated, after some struggle to be sure, because," he said, "there is a growing conviction even among radical elements in government that a great free country like America cannot be controlled by edict and regulation."

At the morning session of the technical division, electric section K. B. McEachron, General Electric Co., in a discussion of lightning, characterized it as a more or less continuous current discharge with one or more current peaks superimposed. Discharges, he said, have an average duration of 0.3 sec. and an electrical charge of 15 coulombs. Peaks, superimposed on such discharges, reach maximum current value in an average of one micro second and last an average of 30 micro seconds. Rate of current rise of peaks is about 13½ kilo amperes per micro second. Electrical charges in such peaks average 0.1 coulomb, Mr. McEachron stated.

Officers of Wisconsin Utilities Association for the coming year were announced in ELECTRICAL WORLD, May 6, page 16.

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Announce 1944 Budget

Wisconsin Public Service Corp. has announced a "hoped for" construction budget for 1944, which will total $1,449,000. It includes as major projects the extension of many miles of rural electric lines, the replacement of oil circuit breakers at Wausau, installation of a propane gas storage tank and auxiliary equipment at the Green Bay gas plant, replacement of a turbine at the Grand Rapids hydro plant, and installation of coal handling equipment and a new water intake line at Bayside steam electric generating station.

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Plans to Dispose of Bus Systems

As a part of a program of disposing of all its transportation business the Wisconsin Power & Light Co., Madison, recently sold the city bus systems in Beloit and Janesville, Wis., to A. P. Gale, former executive vice-president of the company, whose resignation was announced recently. Roscoe G. Walter, formerly supervisor of production, engineering, system operation and maintenance of transmission lines and substations for Wisconsin Power & Light, has been named vice-president in charge of operations. The office of executive vice-president will not be filled, Grover C. Neff, company president, announced. M. H. Frank, vice-president, was elected by the board of directors to fill Mr. Gale's unexpired term on the board.

The Wisconsin utility also announced that its city bus systems at Fond Du Lac and Sheboygan, including the suburban service from Sheboygan to Kohler and Sheboygan Falls, will be acquired by Greenbay Stages, Inc., of Manitowoc. Northland Greyhound Lines are acquiring all the inter-city transportation business of the electric company, which includes a motor coach line from Dubuque, Iowa, to Greenbay and a line from Fond Du Lac to Sheboygan, all operated under the name of Orange Line, it was announced.

Actual transfer of the properties will not take place until the Wisconsin Public Service Commission and the Interstate Commerce Commission have approved the transactions, it was stated.

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Congress Disagrees on REA Loan Funds

The Senate last week boosted to $40,000,000 the appropriation for loan funds to be available in the fiscal year of 1945 to the Rural Electrification Administration, raising the House-approved appropriation by $20,000,000.

The Agriculture Appropriation Bill containing the funds was then passed by the Senate and sent to the House, which disagreed, and a conference committee was appointed to settle the disagreements on the bill.

Possibility of a protracted conference was seen in the fact that the Senate included in the bill appropriations for two programs which had not been appropriated for in the House because no authorization for their appropriation existed. Appropriations without previous authorization are considered legislation in appropriation bills and not allowable under House rules.

Key to the parliamentary situation was the Pace Bill, which had been passed by both Houses and on which a conference report had been reached. The bill authorizes numerous programs whose authorizations had expired, and in addition, extends indefinitely the life of REA while cutting its interest rate to 2 percent and lengthening loan terms to 35 years. No House action had been taken on the Pace Bill conference report early this week.

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Niagara Hudson Units Valuation Determined

New York Public Service Commission has determined the original cost of property of the Lockport and Newfane Power & Water Supply Co., Newfane, N. Y., at $1,080,799 as of Jan. 1, 1938, and prescribed journal entries under which the company must eliminate from its plant accounts a total of $123,054. This amount is to be charged to the utility's earned surplus.

This was the second original cost finding announced by the commission for a company in the Niagara Hudson Power group. The commission had established the original cost of the Niagara, Lockport & Ontario Power Co., one of the major utilities in the System, and required the company to eliminate $4,704,000 from its property accounts.

Pacific Coast Group Holds Regional Conferences

Frank C. Angle, president of PCEA, sounds keynote with an appeal to "be ready for the demands of the peace"—Load building, labor trends, gas turbine discussed—Cleland new president

Two regional conferences, one held in San Francisco May 10 and the other in Los Angeles May 18, concluded the year's activity of the Pacific Coast Electrical Association under the presidency of Frank C. Angle, Pacific Regional Manager, Allis-Chalmers Manufacturing Co. In a brief address Mr. Angle said: "We can see public opinion turning from one of former criticism of the utilities and the industry to that of recognition, because no industry was so well prepared to meet war demands and has performed so nobly, yet was recognized so little. Let us be equal to the demands of the peace—let us face the post-war, not as a hazard, but as a challenge and an opportunity."

At the annual meeting held in San Francisco, Hance H. Cleland, president of the San Diego Gas & Electric Co., was elected president of the Association. He said that he has some definite plans for the coming year and served notice that every member had a job to do. A hint of one thing he may have in mind was contained in his talk before the Administrative Service Section, when he went into his company's program in connection with returning service men at some length. He feels that every utility should have a well worked out and clearly defined program for returning service men that will fulfill the employer's legal as well as his moral obligation.

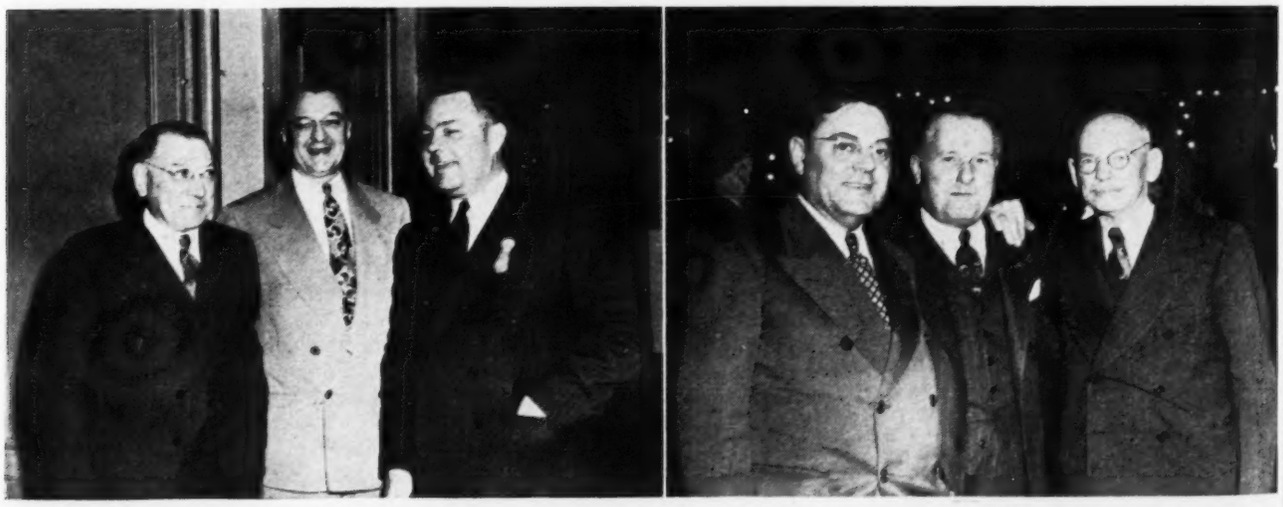
Ernest Ingold, immediate past-president of the San Francisco Chamber of Commerce and formerly in the electrical business, who was guest speaker at an overflow luncheon, decried the trend of government in business. He pictured a tremendous post war-market for the electrical, as well as other businesses, if the country is allowed to proceed on a sound economic basis and in accordance with American ideals.

The operating economics section concerned itself with discussions on future power outlook, load forecasting, labor trends, the gas turbine, apparatus modernization and live line safety practices. Fears of a long post-war period with no further power developments in the West were allayed by George C. Tenney, president, McGraw Hill Co., of California, when he pointed out that the million and a half kilowatts that will be made available for general use after the war represents only a normal three year's load growth, and since utilities anticipate needs by at least two years, the slack period should be of short duration.

Southern California Edison Co. has found per capita consumption to be the most reliable criterion in load forecasting according to J. D. Enefer of that company. In the opinion of L. J. Nevraumont, Pacific Gas & Electric Co., history will not repeat itself after this war with respect to our labor troubles, because both employers and employees have learned something and will not repeat some of the mistakes of the past.

Great advances have been made in the thermal efficiency of the gas turbine and with the use of re-heat cycles and temperatures of 15,000 deg. F., this type of prime mover will exceed in efficiency our highest economy steam turbines and equal that of the internal combustion engines, observed Frank C. Angle, Allis-Chalmers Manufacturing Co. He said the gas turbine looks very promising, especially in units up to 5,000 hp., but that much development remains to be done to put it on a peace-time basis.

In discussing equipment modernization, O. A. Gustafson, General Electric Co., urged utilities to do some blueprinting for post-war modernization and to adopt a repair program for older equipment that can be put under way when the war ends. To prove his point he cited three California jobs under way where capacity had been increased, losses reduced and breakdown forestalled by planned modernization programs. Low accident rate on live line maintenance was attributed to his company's simple but effective training program by Howard Miller, Southern California Edison Co., in presenting a colored film on safety through training.



ACCEPTS CHALLENGE—Urged to accept the post-war era as a challenge rather than a hazard, electrical industry men at the recent Pacific Coast Electrical Association conferences made plans to meet the demands of peace. Those in attendance included (l. to r.): R. M. Alvord, General Electric, San Francisco; Ernest Ingold, Ernest Ingold, Inc., and past-president San Francisco Chamber of Commerce; Frank C. Angle, Allis-Chalmers Manufacturing Co., and president, Pacific Coast Electrical Association; A. E. Strong, Coast Counties Gas & Electric Co., Santa Cruz, Calif.; Wally Glosser, Hubbard & Co., Emeryville and L. G. Owens, retired district manager, Pacific Gas & Electric Co., Redwood City, Calif.

Dr. H. B. Walker, professor of agricultural engineering of the University of California at Davis, said that we may expect two general types of farms in the future, one, the large, highly mechanized and efficient farm, upon which we will depend for quantity production and which will be a distinct national asset from the standpoint of food security, and the other, the small farm within reach of industrial centers where perhaps only part of the needs of the farmer are produced. Both will offer good markets for electrical equipment, but he admonished the electrical industry that to sell this market, a special type of sales talent will be necessary, and that the industry must be prepared to meet the competition for the farmer's dollar.

S. G. Hibben, director of applied lighting, Westinghouse Electric & Manufacturing Co., gave a talk and demonstration on lighting tools for tomorrow's job. He stressed particularly developments in the regions immediately above and below the visible spectrum, the germicidal and health lamps in the upper and drying lamps in the lower, as offering large post-war markets for equipment and energy sales.

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New Boston Edison Tie Line Planned

The Boston Edison Co. has been authorized by the Massachusetts Department of Public Utilities to survey a new transmission line route 28 miles long between the Woburn, Mass., substation and the Leland Street substation at Framingham, Mass., in connection with a proposed 110-kv. circuit designed to meet increasing demands for electrical energy in the western suburban area, to improve service reliability and provide for the transmission of substantial blocks o fpower between the company's main geenrating plants. The project includes expansion of substation facilities at Waltham, with suitable connections with the new line.

The program is designed to enable the new Mystic steam plant of the company at Everett to be utilized more advantageously in supplying energy to cities and towns northwest and west of Boston. At Framingham, connection will be made with a lately completed 10-mile, 110-kv. tie line (Wooden H-frame) to Medway, Mass., through which passes a major two-circuit transmission line connecting the Edgar steam plant of the Edison company in North Weymouth with the Millbury substation of the New England Power System near Worcester.

Future Sales Plans Made in Northwest

Utility representatives, manufacturers and jobbers gather at Boise meeting of Northwest Electric Light and Power Association — Resume of load building plans presented

Laying the ground work for future sales policies, sales managers and other representatives of northwest utility companies, manufacturers and jobbers met at Boise, Idaho, recently under the sponsorship of the utilization section, Northwest Electric Light and Power Association. C. J. Strike, president of Idaho Power Co., keynoted the meeting, stating that commercial department people constitute an important factor in re-establishing a sympathetic understanding by the public of the electrical industry and of individual companies making up the industry.

C. E. Hess, Utah Power & Light Co., section chairman, conducted the meeting which was designed largely for round table discussion among the forty-two registered delegates.

Announcement of a series of meetings to be held the first two weeks in June to bring the future planning of manufacturers, distributors, and utilities to electrical dealers and contractors, was made by C. Patrick Johnson, Puget Sound Power & Light Co., chairman of the new Electrical Development Committee, under whose auspices the meetings will be held. The ten meetings scheduled in this series will cover eight cities in western and central Washington and Lewiston, Idaho, and The Dalles, Oregon. The idea is experimental, explained Mr. Johnson, and similar meetings may be scheduled later in the summer in other parts of the Association's territory.

A survey among 10 companies serving Utah, Idaho, Oregon, Washington and British Columbia, conducted by B. P. Leonard, Pacific Power & Light Co., showed that these companies expected to be serving 21,615 new farms and 96,650 new residences five years after the end of the war. This survey was part of the work of the Section Planning committee of which Mr. Leonard is chairman.

R. B. McElroy, Washington Water Power Co., reporting on the operations of his company's "Trading Post" for small appliances for the first five months, stated that 1,495 small appliances had been placed in service through bringing buyer and seller together and that the average sales price was $5.77.

In a resume of utilities plans for load building after the war, it was brought out that one of the principal problems would be the reconstruction of an adequate sales force.

Manufacturers and jobbers were given an opportunity to tell what they could of their plans and promotions for after the war,—mainly for dealers selling aids.

J. F. McAllister, Utah Power & Light Co., chairman of the committee on standardization, pointed out that the northwest companies are not far apart in their requirements for water heating and advocated accepting the standards developed by NEMA. The group passed two resolutions, one urging all elements of the industry to feature adequate wiring in their advertising and the other urging sales control ordinances throughout the territory to eliminate the possibility of a flood of substandard appliances coming onto the market.

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Michigan Excess Profits Decision Upset

Rates of some Michigan public utilities faced possible reduction as the result of a state supreme court decision directing the state Public Service Commission to consider a public utitlity's excess profits in fixing rates.

The court, by a four to three decision, declared the commission is not required to include excess profits taxes among operating expenses in fixing rates of the Detroit Edison Co. The City of Detroit had appealed unsuccessfully to the commission in 1942 for a 25 percent reduction in Detroit Edison rates because the company was paying excess profits taxes that year of $8,200,000. The commission had contended a utility's excess profits must be considered operating expenses in fixing rates. Under the law, a utility is allowed only a reasonable profit over operating expenses.

Justice George E. Bushnell, writing the majority opinion, asserted "such an attitude almost amounts to nonfeasance, so far as the duty to balance investor and public interest is concerned." He said the commission had ignored "its

discretionary authority to exclude those items from public utility operating expenses which place unnecessary burdens on the consumer."

Declaring that such a policy would make the commission "an impotent body," the opinion declared: "It could not have been the intention of the legislature that the commission should lack any necessary power to fix reasonable rates and the commission should not be permitted to declare itself impotent. It clearly possesses such power and that power should be exercised."

Justice Edward M. Sharpe, upholding the commission's refusal in the minority opinion, said that the excess profits tax "is a tax the company is required to pay and necessarily a part of the costs of the operation of that utility."

As a result of the supreme court decision and in an attempt to find a formula which would permit a reduction in the rates of public utility companies paying excess profits taxes, and at the same time avoid a series of lengthy hearings on individual cases, Gilbert T. Shilson, chairman of the Michigan Public Service Commission, has summoned representatives of all utility companies to a conference in the House of Representatives June 1. He has asked them to be prepared to estimate their 1944 excess profits taxes and to analyze the effect rate reductions would have on net revenues.

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Votes Nisqually Funds

Payment of an additional $300,000 from city light earnings directly on the cost of the $20,000,000 second Nisqually power project was authorized recently by the Tacoma, Wash., city council, acting on the recommendation of Utilities Commissioner R. D. O'Neil.

The newest authorized payment brings to a total of $2,400,000 the amount applied directly from city light earnings on the project, conversion of the transmission line and construction of the tideflats substation necessitated by the expansion. The department also paid out $700,000 on redemption of part of the $16,000,000 in revenue bonds .

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McConnaughey Confirmed

The Senate last week confirmed the appointment of Robert K. McConnaughey as a member of the Securities and Exchange Commission. Mr. McConnaughey, who was appointed last fall to fill the unexpired term of Edmund Burke, will serve a full five-year term expiring in June, 1949.

Utility Men Assist on Fuel Program

Eleven utility engineers have been appointed co-ordinators in the National Fuel-Efficiency Program now being pushed into high gear by Solid Fuels Administrator Harold L. Ickes.

Thus far, 76 of an anticipated 300 co-ordinators have been appointed to supervise the 5,000 regional engineers to be charged with obtaining utmost possible efficiency from fuel burning plants throughout the country.

New appointees follow:

John M. Drabelle, consulting engineer, Iowa Electric Light & Power Co., Cedar Rapids; John McCabe, Minnesota Power & Light Co., Duluth; Burt A. Post, manager, Post Power Supply Co., Appleton, Wis.; B. Y. Buckley, superintendent, Greenwood Electric Light and Water Plant, Greenwood, Miss.; J. M. McIntire, Northern Utilities Co., Casper, Wyo.; Andrew S. Reiff, superintendent, City Water and Light Department, Hastings, Nebr.

W. A. McDonald, superintendent, power department, Houston Lighting & Power Co., Houston, Texas; C. W. Burdick, Commissioner, City Water Light and Ice Co., Grand Island, Nebr.; Gerald E. Chess, industrial power engineer, Pacific Gas & Electric Co., Fresno, Calif.; E. M. Naughton, Jr., Utah Power & Light Co., Salt Lake City, Utah; Lincoln F. Kielsmeier, power engineer, Ohio Edison Co., Springfield, Ohio.

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Public Ownership Trend Forecast in Parleys

A series of conferences among representatives of cities and municipalities with Premier John Hart of British Columbia, Canada, were held recently in Victoria, with the purpose of formulating plans for the entrance of the province in the field of public ownership of utilities.

Announcement was made that the conferences cleared up disagreements on the question of leadership toward the goal and all now agree that "public ownership of public utilities in the Province of British Columbia is in the public interest." A permanent seven-man committee, headed by Mayor J. W. Cornett of Vancouver, will press for negotiations for the purchase of the B. C. Electric Railway Co.

At the conference the decision was reached to carry on discussion not only of public ownership of that utility, but on public ownership of all public utilities as a basic policy for the province.

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Cities Service to Drop Utility Properties

Cities Service Co. has notified the Securities and Exchange Commission that it elects to retain its oil, wholesale natural gas, real estate and other non-utility business, and will dispose of its utility interests to the extent necessary to relieve the company from regulation under the Holding Company Act.

The petition was in answer to the SEC's divestment order of May 5, which gave the company its choice of disposing of its interests either in the utility or non-utility business. The petition just filed asks that SEC supplement its recent order to reflect the company's choice.

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Stockholders Vote Merger

Plans for the merger of the Virginia Electric & Power Co. and Virginia Public Service Co. took a long stride forward with the official announcement last week that stockholders of both companies had overwhelmingly approved the merger.

MEETINGS

Previously Listed

Edison Electric Institute—Annual meeting, Waldorf-Astoria Hotel, New York, N. Y., June 6-7. Col. H. S. Bennion, managing director, 420 Lexington Ave., New York 17, N. Y.

Public Utilities Advertising Association—Annual meeting, Palmer House, Chicago, Ill., June 6-8. Waldo M. Wright, secretary, Amarillo Gas Co., Amarillo, Texas.

National District Heating Association—Annual meeting, William Penn Hotel, Pittsburgh, Pa., June 14-15. John F. Collins, Jr., secretary-treasurer, 827 N. Euclid Ave., Pittsburgh, Pa.

Iowa Utilities Association—Post-war planning conference, Des Moines, Iowa, June 19-20. Wm. R. Blake, secretary-manager, 606 Fleming Bldg., Des Moines, Iowa.

American Society of Agricultural Engineers—Annual meeting, Schroeder Hotel, Milwaukee, Wis., June 19-21. Raymond Olney, secretary, St. Joseph, Mich.

American Society of Mechanical Engineers—Semi-annual meeting, William Penn Hotel, Pittsburgh, Pa., June 19-22. Ernest Hartford, executive assistant secretary, 29 W. 39th St., New York 18, N. Y.

Canadian Electrical Association—Annual meeting Murray Bay, Que., Canada, June 22-23. B. C. Fairchild, managing director, 804 Tramways Bldg., Montreal, Que.

Society for Promotion of Engineering Education—Annual meeting, University of Cincinnati, Cincinnati, Ohio, June 22-25. F. L. Bishop, secretary, University of Pittsburgh, Pittsburgh, Pa.

American Society for Testing Materials—Annual meeting, Waldorf-Astoria Hotel, New York, N. Y., June 26-30. Robert J. Painter, assistant secretary, 260 S. Broad St., Philadelphia 2, Pa.

American Institute of Electrical Engineers—National technical meeting, Jefferson Hotel, St. Louis, Mo., June 26-30. H. H. Henline, national secretary, 33 W. 39th St., New York 18, N. Y.

Output Curve Moves Slightly Upward

The output curve moved slightly upward again during the week ended May 20, 1944, according to figures released by the Edison Electric Institute. The amount of electrical energy distributed by the light and power industry during the week came to a total of 4,245,678,000 kw.-hr., as compared to the figure of 4,238,375,000 kw.-hr. for the week previous, which ended on May 13. Figures for the week represented an increase of 6.3 percent over the 3,992,250,000 kw.-hr. distributed during the corresponding week a year ago. The output for the similar week two years ago was lower, the total being 3,379,985,000 kw.-hr.

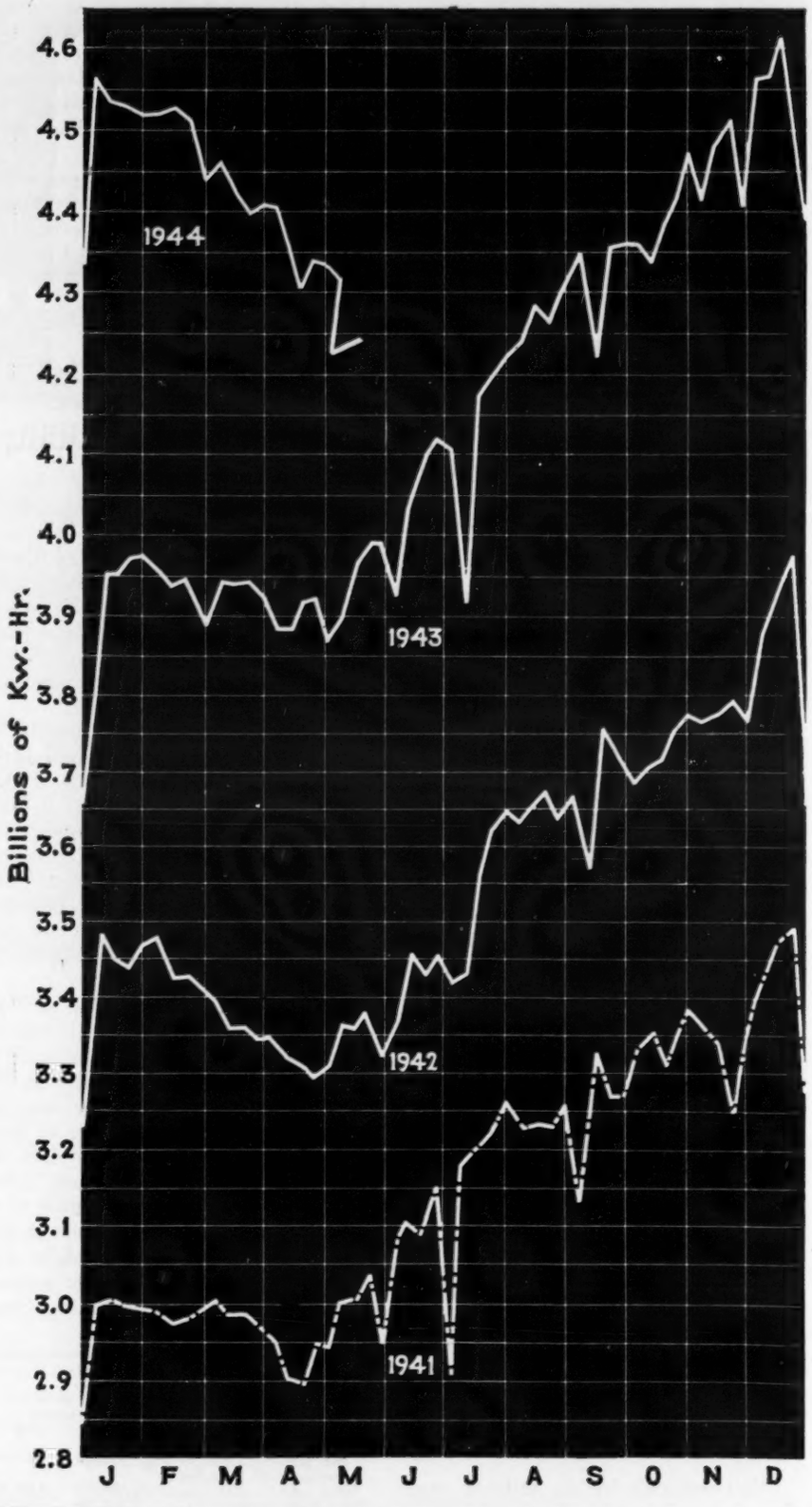
Five of the seven major geographic regions of the country reported increases for the week over the corresponding week last year, the Pacific Coast group retaining first place with an increase of 15.2 percent. New England's increase of 0.7 percent for the week ended May 13 was converted into a loss of 0.8 percent for the week ended May 20. The Rocky Mountain states, which reported a decrease of 9.4 percent for the week ended May 13, showed a loss of 9.7 percent for the week ended May 20.

Weekly Output Millions Kw.-Hr.

1944		1943		1942	
May 20	4,246	May 22	3,992	May 23	3,380
May 13	4,238	May 15	3,969	May 16	3,357
May 6	4,234	May 8	3,904	May 9	3,365
Apr. 29	4,336	May 1	3,867	May 2	3,305
Apr. 22	4,344	Apr. 24	3,925	Apr. 25	3,273
Apr. 15	4,307	Apr. 17	3,917	Apr. 18	3,308
Apr. 8	4,361	Apr. 10	3,882	Apr. 11	3,321
Apr. 1	4,409	Apr. 3	3,890	Apr. 4	3,349
Mar. 25	4,409	Mar. 27	3,928	Mar. 28	3,346
Mar. 18	4,400	Mar. 20	3,947	Mar. 21	3,357
Mar. 11	4,426	Mar. 13	3,945	Mar. 14	3,357
Mar. 4	4,465	Mar. 6	3,947	Mar. 7	3,392

Percent Change from Previous Year

	Week Ending		
	May 20	May 13	May 6
New England	− 0.8	+ 0.7	+ 1.8
Mid-Atlantic	+ 3.6	+ 4.0	+ 6.0
Central Industrial	+ 4.9	+ 5.5	+ 6.1
West Central	+ 7.4	+ 4.4	+ 6.1
Southern States	+ 9.3	+ 7.4	+10.4
Rocky Mountain	− 9.7	− 9.4	− 5.0
Pacific Coast	+15.2	+19.8	+20.9
Total United States	+ 6.3	+ 6.8	+ 8.5



Court Sustains United Light & Power Plan

The U. S. Circuit Court of Appeals, Philadelphia, has unanimously sustained the United Light & Power Co.'s plan, under which common stock of United Light & Railways Co. would be distributed.

In dismissing objections to the plan by Otis & Co., Cleveland, holder of ten shares of United Light preferred, the court ruled that common stock of a solvent public utility that is being dissolved under the holding company act is entitled to share to some extent in distribution of assets because liquidation or dissolution is an involuntary one forced upon the corporation by an act of Congress rendering the corporation powerless to fulfill its contractual obligations to its preferred stockholders.

Otis & Co. has petitioned the U. S. Supreme Court for a writ of certiorari for a review of the decision of the Circuit Court of Appeals upholding the SEC on all counts.

Quebec Hydro Cuts Rates $2,210,000

Electric rate reductions for the Montreal metropolitan district, amounting to $2,210,000 annually were announced last week by Senator T. D. Bouchard, Quebec Hydro-Electric Commission chairman. The announcement was made one day after the Hydro Commission had reported conclusion of labor agreements designed to raise the salaries of employees by $300,000 annually. Senator Bouchard said that although the price to be paid the Montreal Light Heat & Power Consolidated for its expropriated properties could not yet be forecast, the announced reductions were justified by appraisals made over the last three years by the Quebec Public Service Board.

Reductions were as follows: domestic consumers $950,000, or 19 percent; commercial consumers, $780,000, or 18 percent; three-phase motor power, entailing some commercial and some lighter industrial consumers, $350,000, or 20 percent; City of Montreal municipal service direct current street lighting, $130,000, or 30 percent.

It was also announced that consumers will no longer have to pay a 2 percent charge for paying their accounts at the bank. The commission proposes to assume this expense, amounting to approximately $30,000 annually.

The commission chairman declared that the question of rate reductions to big industrial users of electricity would be taken up at once.

All reductions now announced will apply to bills covered by meter readings taken from June 15 onwards. The reductions it was pointed out, are subject to approval by Order-in-Council and signature of the Lieutenant Governor.

Officials of both the Shawinigan Water & Power Co. and the Gatineau Power Co. stated that new rate schedules would soon be announced.

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Fluorescent Group, WPB Sift Fixture Control

Vast demands by the military services for radio and radar transformers must continue to curtail the production of fluorescent lighting fixtures because production ballasts and transformers for them cannot be increased, WPB has reported.

Members of the Fluorescent Lighting Fixture Industry Advisory Committee discussed with WPB methods of controlling fixture production to keep it in line with ballast and transformer production. It was brought out that L-78 curtailment of less essential types of fixtures would hold down the demand for ballasts and transformers and free those which are available for standard fixtures.

Members were cool to a proposal that fixtures be standardized, pointing out that manufacturers are tooled up to produce their own designs and would encounter considerable delay in changing to standardized models.

•

Denison Dam Power Sold to Utility

Interior Secretary Harold L. Ickes has approved a contract for disposition of the energy output of the Denison Dam power house on Texas' Red River which requires the Texas Power & Light Co. to pass on to the government and its residential and commercial customers the benefits accruing to it from the purchase of federally-generated energy.

The contract, valid for the war's duration and six months or until July 1, 1949, was described by some Washington observers as favorable to the government in the matter of rates and terms but favorable to the company insofar as the Southwestern Power Administration, which markets Denison energy, is precluded for the life of the contract from competing with TP&L in its own territory.

TP&L will receive 30,000-kw. of firm power and 120,000,000 kw.-hr. yearly at 5 miles per kilowatt-hour, with SPA reserving the right to recapture on 18 months notice 15,000-kw. for sale in Oklahoma. Another 5,000-kw. of firm capacity will be marketed by SPA in Oklahoma from the outset, and 7,000-kw. of dump capacity, amounting to a 20 percent overload on Denison's single 35,000-kw. turbine, is reserved for coordination of SPA's three dam system, which includes also Grand River Dam in Oklahoma and Norfork Dam in Arkansas. Facilities for interconnection of Denison with the other two dams are currently meager.

TP&L agreed to reduce rates to 17 Army and Navy camps by 10 percent and to reduce by at least $300,000 rates to residential and commercial consumers, the total reduction approximating $400,000. In addition, it agreed not to boost temporary rates to six Rural Electrification Administration co-ops, which stand now at somewhat below six mills per kilowatt-hour. It will take such firm capacity as SPA undertakes unsuccessfully to market in Oklahoma and will take such dump power as Denison offers at 2.5 mills per kilowatt-hour between 8 a.m. and 6 p.m. daily except Sundays and holidays, and at 1 mill per kilowatt-hour at other times.

It was understood that the 5 mill rate for firm power was somewhat in excess of TP&L's generation cost at its Trinidad plant. The company avoided, however, SPA's exercise of its "common carrier" privilege accorded it under the presidential directive assigning the marketing of Denison power to SPA. Had the "common carrier" clause been invoked, SPA could have required TP&L to move Denison energy to war plants at Dallas and Fort Worth currently served by TP&L. Under the contract, all Denison energy moving other than into Oklahoma will go to TP&L.

UTILITY REPORTS

	Net Income 1944	1943
*American Gas & Electric and subs	$11,705,083	$10,972,295
†Commonwealth & Southern and subs	11,860,977	11,691,256
†Consumers Power	7,676,746	7,669,467
*Dayton Power & Light	1,541,455	2,299,569
†Detroit Edison and subs.	9,048,995	8,292,442
*El Paso Electric (Texas)	555,296	511,397
*Gulf States Utilities	2,315,267	1,752,750
†Idaho Power	1,341,151	1,275,132
*Niagara Hudson Power and subs	5,867,500	6,145,099
†Ohio Edison	3,073,512	3,170,195
*Pacific Gas & Electric	22,722,158	22,473,738
*Rochester Gas & Electric	3,022,258	2,873,394
*Savannah Electric & Power	260,596	204,471
*West Penn Electric and subs	5,014,905	5,125,992

*Twelve months ended March 31.
†Twelve months ended April 30.

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Denied Plant Addition

G. K. Fisken, deputy controller of construction, in turning down an application from the Winnipeg Hydro-Electric System to construct a $250,000 addition to its Slave Falls plant, wrote that the labor situation was not sufficiently clarified to insure the work could be carried on without difficulties. He added the suggestion that the application be renewed in three months time. This information was made available in a return tabled in the Canadian House of Commons by Hon. C. D. Howe, Minister of Munitions and Supply.

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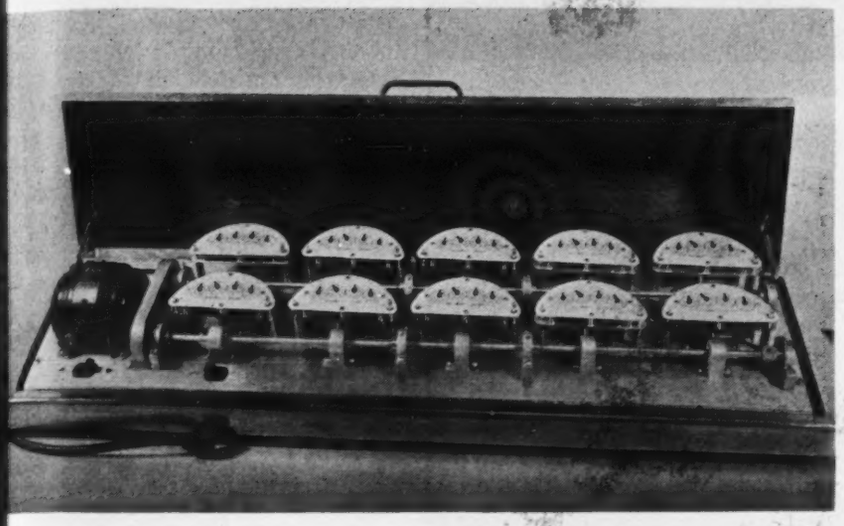
PUD to Issue Bonds

Consumers Public Power District of Nebraska is inviting tenders to be opened May 31, on an issue of $41,533,000 electric system revenue refunding bonds, proceeds to be used for redemption of the entire outstanding debt of the state-wide system. The Consumers issue will consist of $36,324,000 Eastern System and $5,209,000 Western System bonds, all dated July 1, 1944, and due semi-annually Jan. 1, 1946 to 1972.

HOW

DESIGN · CONSTRUCT · OPERATE · MAINTAIN



HOME BUILT register ratio checker for Sangamo type J watthour meter registers

Register Ratio Checker For Watthour Meters

By J. C. HUMBEL

Asst. Foreman, Shop Testing Division, Meter Dept., Detroit Edison Co., Detroit, Mich.

Practice of the Detroit Edison Co. for the past twelve years has been to check the register ratio of all watthour meters each time they are tested in the meter shop. The number of errors found is of course exceedingly small but it has proved to be low cost insurance against incorrect billing.

In recent years, the meter manufacturers have done a very good job in holding down the number of register ratio errors. Wartime conditions, however, have introduced new hazards. Rebuilding meters necessitates many register replacements, and changing of gears and worms. Only by strictly checking each register can errors be prevented from creeping in.

A group of motor driven gang checkers for each type of register has been assembled.

The illustration shows one of the later checkers designed by the meter department, and built in the company's shops.

One of the registers shown on the checker is the standard. It has a ratio of ten and is equipped with jewel bearings and a resetting device. The first dial is graduated into fractions.

The method used in checking register ratios is as follows:

The standard register is set at zero. The registers to be checked, all of the same marked ratio, are manually set to a reading of 9,900. The registers are placed on the checker, which is provided with accurately machined guides and stops to insure correct meshing of gears.

The group is driven forward until the standard register reaches the marked ratio of the registers. The dial hands of each register will stop on zero if the ratio is correct. Final readings other than zero indicate an incorrect ratio.

The check run is of sufficient length to detect errors which would cause over- or under-registration of one percent or more. In practice the smallest errors of registration found have been two-and-one-half percent.

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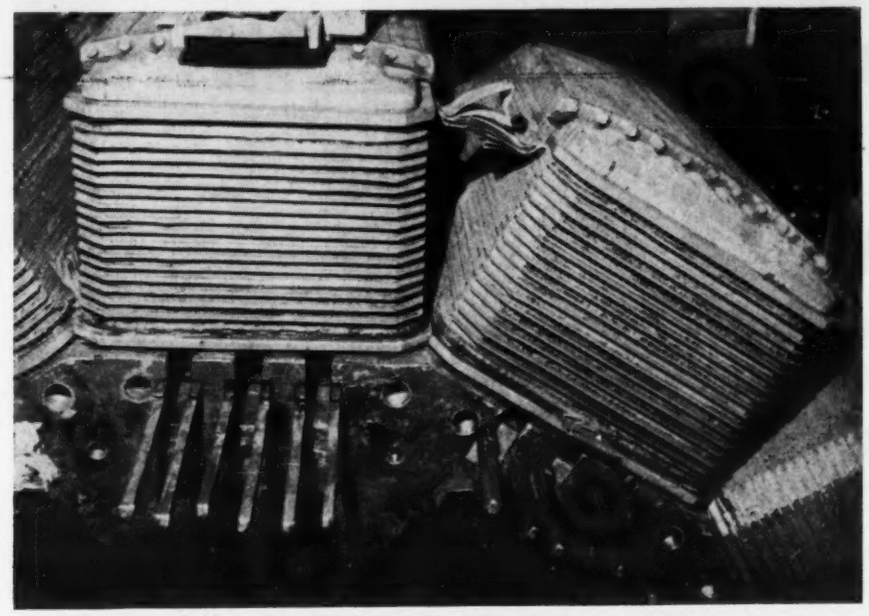
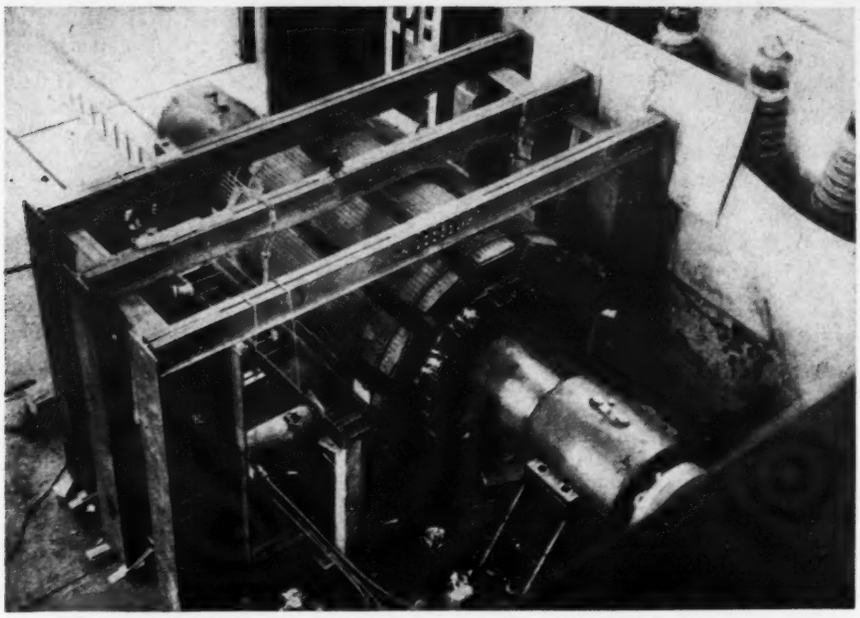
Removing and Replacing Condenser Field Poles

After ten years of hard service a 30,000-kva., 6,600-volt, 600 rpm. synchronous condenser began to develop faults in the field poles, especially in the veneer insulating rings. These started to crack and be thrown off. Removal of the twelve poles, each weighing 2½ tons, was the toughest part of the repair job. It was found impossible to push the poles off the spider with hydraulic jacks, even using up to 150 tons of pressure. The job was done by removing the wedges by thermal means. It was described in a recent issue of "Shawinigan Journal," the employees' magazine of Shawinigan Water & Power Co. and affiliated companies.

There are three grooves cut in the spider for each pole, and fitting into these grooves are the three tongues attached to the pole, thus holding the pole to the spider. To insure a tight fit of tongue and groove, wedges are driven into the groove on both sides of the tongue and from both ends of the rotor; the wedges from opposite



WEDGES insure tight fit of pole tongue in spider groove



THREE 300-ton hydraulic jacks braced against I-beam frame press poles into grooves for wedging. Vertical members are 24 x 12 x ¾-in. reinforced with four sections of channel at the points where jacks are applied; horizontal members are double channels of 10 x 2½ x ¼ in.

sides of the rotor overlap and press the tongue tightly against the groove.

The wedges were finally removed by a homemade tool. A piece of ¾-in. steel rod, threaded at one end, was welded at the other end to the large end of the wedge, and heated red hot. A piece of heavy duty pipe was then slipped over the rod with one end resting against the spider, and a nut screwed on to the heated rod tightened up against the pipe at the other end. When the rod cooled it contracted, pulling the nut against the pipe. The pipe, in turn, pushed against the spider with the result that the wedge was loosened and pulled out. With this method very great forces were exerted upon one wedge at a time, whereas using the jack against the pole face, the force was distributed between the twelve wedges on that pole and was, therefore, only one-twelfth as effective.

After pole repairs at the manufacturer's factory the machine was reassembled by use of a special jacking frame built of I-beams and channels. The poles were first centered on the rotor and wedges driven in with a pneumatic hammer. A jacking frame was built and pressures up to 300 tons were used to press opposite poles against the rotor, at the same time the wedges being further driven in as far as possible. The illustration above shows a view of the rotor and jacking frame with the wedges partially driven home. After the pole assembly was completed, the rotor was given a potential test of 5,000 volts for one minute. (It is normally subjected to 250-volt stress.)

Following this, the machine was given an overspeed test, and the wedges were checked and cut off flush with the spider. After the installation of fans and end bolts and after the machine had been given its "dry-out" run, a final dynamic balancing test was conducted, giving less than one-half of a thousandth of an inch amplitude of vibration on each bearing. The use of a dynamic balancing set improved the dynamic balance of the unit to a state which had never been obtained with the use of older methods, and in far shorter time. All balancing tests were made at rated speed of 600 rpm., with the machine running from an auto transformer using the 30 percent voltage tap.

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Electrodes for Field Ground Connection

Two copper-sulphate non-polarizing electrodes which have been helpful in field tests and experiments involving temporary grounds were described in a paper by M. C. Miller, Electrical Engineer, Ebasco Services Inc., New York City, before the Bureau of Standards Corrosion Conference at St. Louis, Mo. recently.

These electrodes may be assembled from materials normally available and can be assembled by any "handy man" with a few tools. A transparent plastic holder, a standard part of a shrub-spraying outfit made for attaching to a lawn hose, is made use of in the making of the smaller electrode shown in Fig. 1. This holder has a one-inch male and female hose thread. A wooden plug is fitted into the female thread at the bottom while a plastic cap nut is at the top. This nut supports the copper stud which serves as the terminal and to which is attached a coiled No. 20 wire.

This electrode has two advantages over ones previously used: (1) The transparent holder assures that a dry electrode will not be used. By adding extra copper-sulphate crystals, a sat

urated solution is assured, and as the solution is lost, distilled water may be added. (2) Large area of the wooden plug gives lower contact resistance and more nearly correct potential readings. The resistance of two plugs placed end to end is about 150 ohms. The large area (approximately 15 sq. mils) of copper in contact with the copper sulphate solution reduces electrode polarization. No indication of polarization has been encountered in using these with a voltmeter of 100,000 ohms resistance.

This small electrode has been found satisfactory for use on cross country lines, and in city and urban work where moist soil can be contacted.

A large electrode has been made of standard, readily available parts and

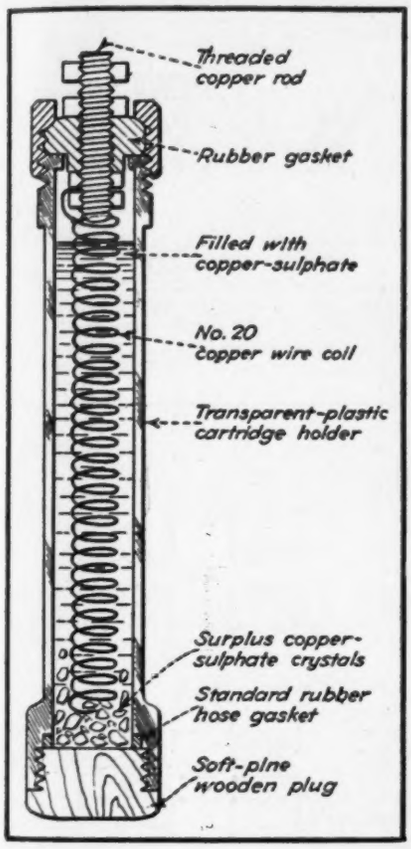

FIG. 1. Small electrode for use on comparatively high resistance grounds.

is shown in Fig. 2. The bottom is a 6-in. rubber "plumber's helper" while the copper tube is an overflow pipe of a toilet, covered with rubber or some other insulating material. A wooden disk of soft pine 6½ in. in diameter is fitted into the bottom as shown. The terminal is soldered to the copper pipe. After cleaning the copper, the pipe and rubber foot is filled with copper-sulphate solution with some

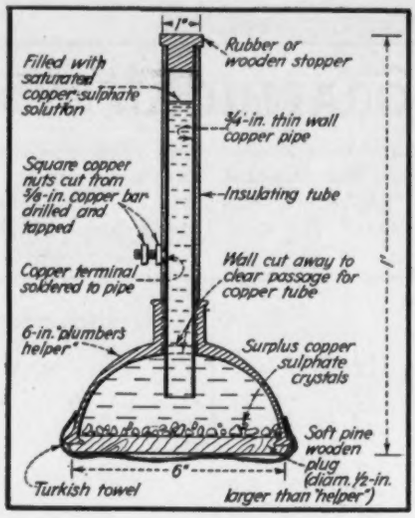
1"
Rubber or wooden stopper
Filled with saturated copper-sulphate solution
¾-in. thin wall copper pipe
Square copper nuts cut from ⅜-in. copper bar drilled and tapped
Insulating tube
Copper terminal soldered to pipe
Wall cut away to clear passage for copper tube
6-in. "plumbers helper"
Surplus copper sulphate crystals
Soft pine wooden plug (diam. ½-in. larger than "helper")
6"
Turkish towel

FIG. 2. Large area electrode for use on hard surfaces having high resistances.

surplus crystals. As this may be used on dry city streets where contact resistance is high, a turkish towel is tied around the bottom to make a low resistance contact with the dry ground, concrete, black top, etc. While in use this towel is kept damp; while not in use and to keep from drying out a waterproof "disk cover" is put over the towel.

In addition to low resistance contact, this large electrode has two advantages over the small. It can be set down on concrete, dirt or other surface and does not need to be held up or dug in, permitting the user to set up his instruments, take readings, etc. with a minimum of delay. To facilitate using, a wooden handle tied to the pipe avoids the necessity of bending over to set the electrode down or pick it up. The cost of these electrodes varies from $1 to $2 each.

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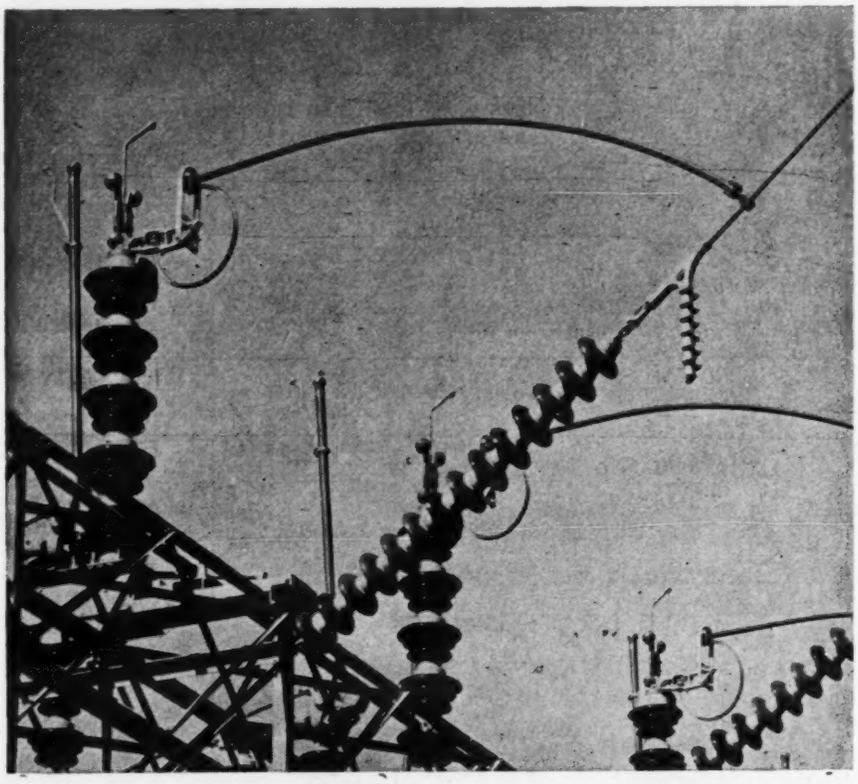
Author's Affiliation

Through error the connection of R. L. Murray, the author, with the Alabama Power Co. was not printed with an article entitled "Turn Ratio Meter for Transformers." The article, adapted from a paper at a recent conference of Doble Engineering Co. Clients, was published in ELECTRICAL WORLD, April 29, 1944, page 96.

Preventing Movement of Post Insulators



WHERE LINE WIRES take off from a switchrack at a vertical angle as shown, there is the problem of post insulator breakage or loosening caused by the movement transmitted to the post insulator through the jumper as the line conductor rises and falls due to temperature changes. The switch manufacturer solved the problem by designing a hinged mechanical connection with flexible wire semi-circular jumper as illustrated. The switchrack is for a 220-kv. line installed at a new California hydro plant.

NEW GRAPHICAL SYMBOLS

Accompanying outline of symbols has been adapted from the recently approved American War Standard, American Standards Association No. Z32.11-1944, "Coordination of Electrical Graphical Symbols." The standard offers a practical solution to the conflicting practice which has hitherto existed, among different branches of the electrical industry in connection with the symbols for resistors, inductors and coils, and capacitors.

1. Capacitor

1.1 Fixed

2.1 Variable or Adjustable

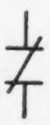
NOTE: Where it is necessary to identify the capacitor electrodes, the curved element shall represent the outside electrode in fixed paper-dielectric and ceramic-dielectric capacitors, the negative electrode in electrolytic capacitors, and the movable element in variable and adjustable capacitors. When it is desired especially to distinguish trimmer capacitors, the letter T should appear adjacent to the symbol.

2. Contact

2.1 Simple

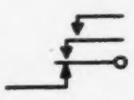
Open

Closed



NOTE: The line representing contacts shall be approximately equal to 1¼ times the width of the gap between the lines.

2.2 Simple or Sequence

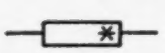


NOTE: The symbol for sequence contact may also be used for a simple contact in order to maintain uniformity and avoid confusion on drawings.

3. Resistor (Including Rheostat and Voltage Divider)

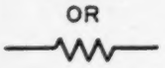
3.1 Fixed

Simple:



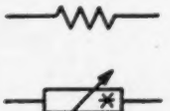
OR

Detailed:



3.2 Variable or Adjustable

Simple:



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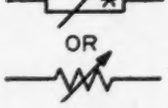
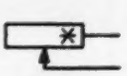
Detailed:

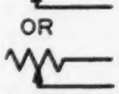


Simple:



OR

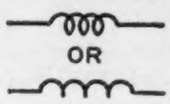
Detailed:



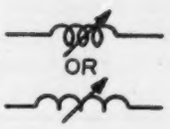
* This symbol must always be used with an identifying legend within or adjacent to the rectangle.

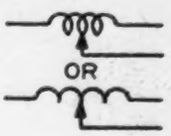
4. Inductor

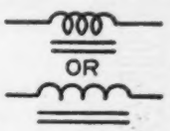
4.1 Fixed



4.2 Variable or Adjustable

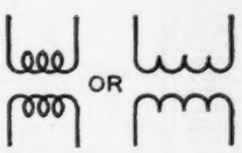




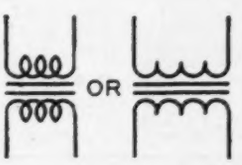


NOTE: When it is desired especially to distinguish magnetic core inductors, a line or lines parallel to the axis of the loops should be used, as in accompanying diagram.

5. Transformer

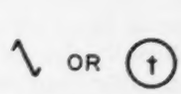


NOTE: When it is desired especially to distinguish magnetic core transformers, a line or lines parallel to the axis of the loops should be used, as in accompanying diagram.



6. Operating Coil

Simple:

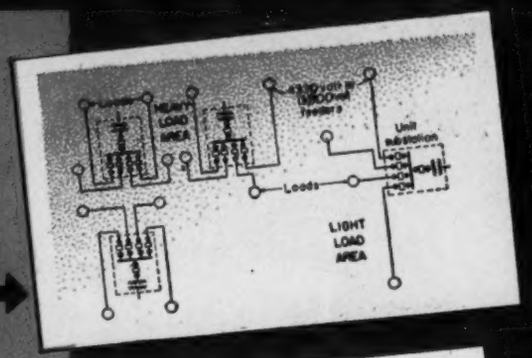


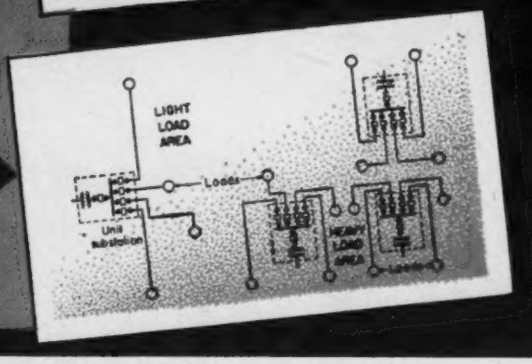
† This symbol must always be used with an identifying legend within or adjacent to the circle.

Detailed:

NOTE: This symbol is customarily used with sequence contacts.

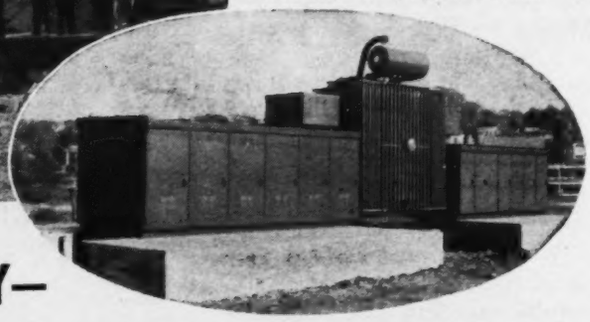
TO SUPPLY
QUICKLY NEW LOADS →
---THAT ARE LIKELY
TO SHIFT →





Install UNIT SUBSTATIONS

Even large unit substations like this (3000 kva) are shipped in completely assembled sections. Skid them into position, bolt them together, make the necessary connections—and the unit substation is ready for service.



YOU CAN INSTALL THEM QUICKLY—
AND MOVE THEM EASILY IF THE LOAD SHIFTS

YOU can order and install G-E unit substations in a fraction of the time required for old-style, "piecemeal" substations. They are delivered in compact, completely assembled sections. By locating them right at load centers, you shorten secondary runs, save vital copper, and reduce losses.

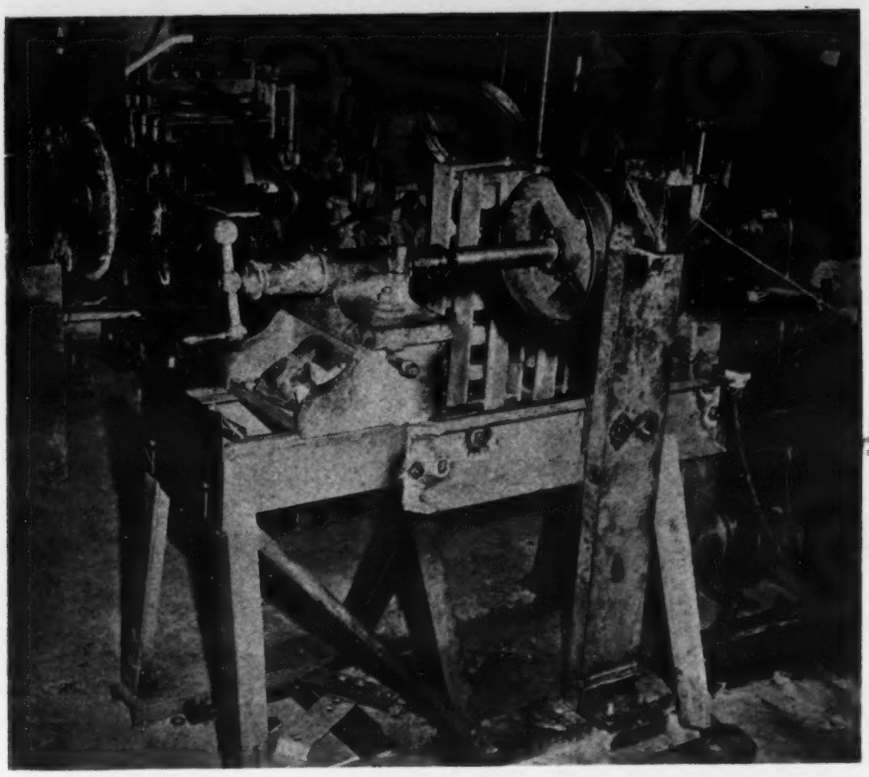
What's more, if the load shifts, the easy-to-handle sections make it easy to move a unit substation to the new load center, whether it be yards or miles away.

Installed, a unit substation is a single, coordinated, safety-enclosed unit that functions more dependably and gives extra protection to personnel. Designed for outdoor service—and with a pleasing appearance—they make large investments in real estate and buildings unnecessary.

From every angle, *unit* substations are the practical, far-sighted answer to the changing power requirements of today and tomorrow. An attractive 36-page booklet (GEA-3800) contains complete, useful information. You can get a copy from your local G-E office, or by writing General Electric Co., Schenectady, New York.

GENERAL ELECTRIC

302-15-5800



LATHE PROVIDES motive power for drawing wire through a die in the steel slotted box in the production of No. 6 H.D. wire from scrap. Take-up reel in rear holds tension and coils newly drawn wire. Short lengths of copper wire are made usable

Wartime Wire Salvaging Is Made to Pay

Spare time and otherwise unusable short lengths of copper wire are converted into No. 6 bare hard drawn wire by a home-made wire drawing machine in the warehouse of the Washington Water Power Co., Spokane, Wash. The wire is stripped of insulation, electrically butt welded, electrically annealed, straightened by a home-made device and then passed through the wire drawing assembly shown.

A shop lathe with several turns of wire around a steel drum is used to draw the wire through a die held in a channel iron support. The power driven reel shown in the background holds tension on the wire as well as serving to coil the newly drawn wire. One draw is required for each reduction from one standard size to the next smaller. Thus, to draw No. 6 from No. 1, requires three draws. Each draw hardens the wire and the No. 6 ends up as hard drawn wire.

With this wire salvaging program the company has been able to manufacture practically all of its No. 6 wire requirements at a large saving in cost, while at the same time aiding in the war effort. The entire program and design of special equipment was worked out by R. D. Williams, general storekeeper of the Washington water Power Co.

•

Automatic Control Switches Capacitors

By R. E. MARBURY
Switchgear Engineer, Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa.

In most distribution circuit capacitor applications banks of pole-mounted capacitors of 180 kva. or less are located along the line and left permanently connected to the line. A simple automatic control has been developed for use with an oil contactor for connecting and disconnecting the capacitors in accordance with the voltage on the circuit at the point where the capacitors are installed. The total kva. of permanently connected capacitors is usually determined by the minimum reactive kva. required by the circuit loads. Therefore, in order to obtain the greatest benefit from the use of shunt capacitors during peak loads, the connected capacitor kva. added to take care of peak loads should be varied by automatic means.

Since this automatic control device is intended for small banks of capacitors such as 180 kva., it has been made as simple and compact as possible. The control contains a primary relay, which is adjustable over a range of 90 to 110 percent of the 115-volt base. The band width can be readily adjusted from 3 to 7½ percent. Two time-delay relays are used, one to give time delay in energizing the capacitor, and the other to provide for time delay in disconnecting the capacitor. An auxiliary contactor is used to provide the means for energizing the closing coil of the oil contactor.

The complete control is arranged for mounting on a pole and providing for accessibility of the primary relay for adjustment purposes. Conduit connections are provided on the housing for bringing in the 230-volt control circuit and the 115-volt potential leads. The potential source must be provided separately. This may be an outdoor potential transformer, but usually the practice is to use a small distribution transformer such as 1½ kva. with 115/230 volt secondary

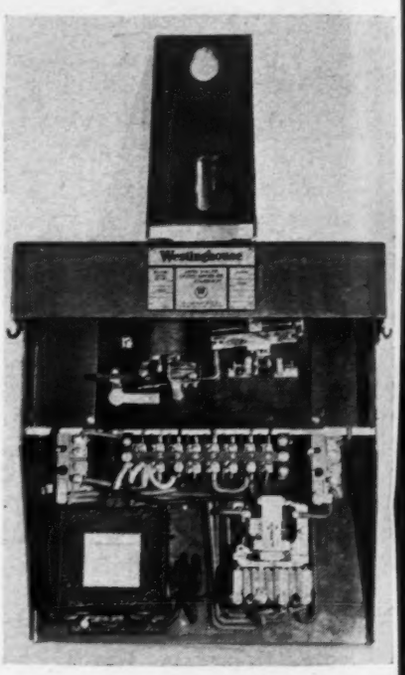
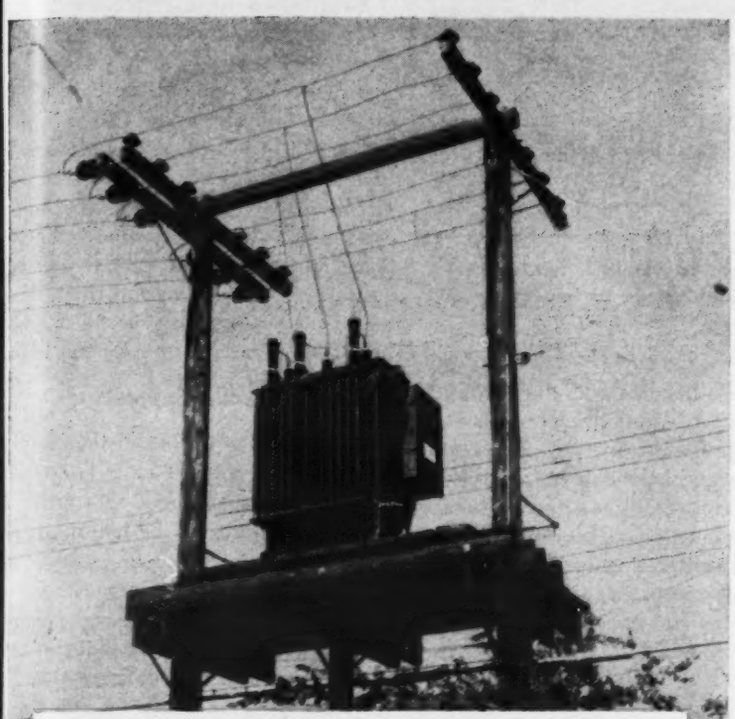


FIG. 1—Control unit for automatically switching pole-mounted capacitor bank: housing removed, providing access to primary voltage relay

since the 230 volts can be used for the control voltage. Fig. 1 shows the control unit with the lower portion of the housing removed to provide access to the primary voltage relay. Fig. 2 shows the schematic diagram of the control.

While the above control is designed

Meet the family of G-E regulators that are helping to find hidden kw



STEP REGULATOR (MLT-32)—For urban and rural circuits, 69,000 v and below. Ideal for the higher-voltage and larger-kva circuits, where 3-phase regulation is satisfactory. Provides 10% regulation, raise and lower, in thirty-two 5/8% steps.

TYPE MLT-32, THREE-PHASE, 60 CYCLES

2400 V	4160 V	4800 V	7200 V	12,000 V
125 kva	144 kva	83.2 kva	62.4 kva	104 kva
150	180	125	125	156
200	216	166	200	208
250	250	250	250	250
300	300	300	300	300
375	375	375	375	375
500	500	500	500	500
600	600	600	600	600
750	750	750	750	750

13,800 V	23,000 V	34,500 V	46,000 V	69,000 V
120	200	200	200	200
179	250	250	250	250
239	300	300	300	300
300	375	375	375	375
375				
500	500	500	500	500
600	600	600	600	600
750	750	750	750	750

TYPE IRS, SINGLE-PHASE, 60 CYCLES

2400 V	4800 V	6900 V
12	12	17.3
24	24	34.5
36	36	69
48	48	
60	60	
72	72	
96	96	
120	120	

TYPE ML-4, SINGLE-PHASE, 60 CYCLES

2400 V	4800 V	6900 V
12	12	8.6
24	24	17.3
	48	34.5
		51.8

TYPE AIRS, SINGLE-PHASE, 60 CYCLES

Automatic				Hand operated	Motor operated
120 V	240 V	480 V	600 V	120/240 V	120/240 V
1.2	1.2	1.2	1.5	1.2	1.2
2.4	2.4	2.4	3	2.4	2.4
3.6	3.6	4.8	6	4.2	4.2
6	6	7.2	9	6	6
9	9	9.6	12	12	12
12	12	12.0			

FEEDER VOLTAGE REGULATORS

INDUCTION REGULATOR (IRS)—Ideal for severe operating conditions, such as 2400- and 4800-v city feeders. Provides 10% regulation, raise and lower. Available with either oil or Pyranol. On sizes 12 and 24 kva, cross-arm mounting feature is optional.

BRANCH STEP REGULATOR (ML-4)—For automatic regulation on branch and rural circuits where more expense is not justified. Provides 10% regulation, raise or lower, in four 2½% steps.

AIR-COOLED REGULATORS (AIRS)—For secondary distribution circuits, such as factory or office-lighting circuits. A convenient source of variable voltage for testing or laboratory use. The *automatic* regulator provides 10% regulation, raise and lower; the *hand-operated* unit, 100% raise and lower.

• These are the G-E voltage regulators that are keeping the voltage up for war production, often taking the place of new feeders. They are helping power companies make more effective use of the equipment on their systems. They make additional capacity available for new loads with huge savings in time, money, and critical material. Ask your G-E representative to evaluate the benefits of G-E regulators on your system.

GENERAL ELECTRIC

General Electric Company, Sec. A404-34, Schenectady 5, N. Y.

Yes please send me detail information on the following voltage regulators:

- ☐ Type MLT-32 (GEA-1577)
- ☐ Type IRS, 12 and 24 kva (GEA-2018)
- ☐ Type IRS, 36 kva and above (GEA-2985)
- ☐ Type ML-4 (GEA-2038)
- ☐ Type AIRS (GEA-3057)

NAME .....

COMPANY .....

ADDRESS .....

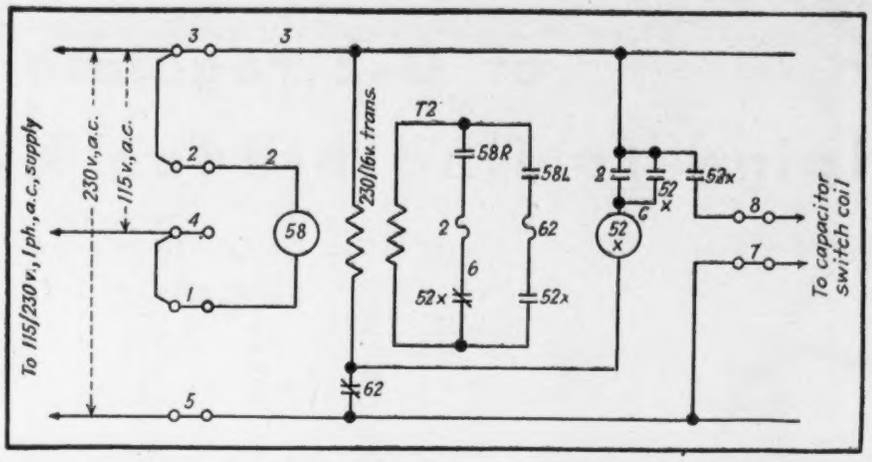


FIG. 2—Schematic diagram of automatic switching control for capacitor banks. Device 58, type SU voltage relay; 2 and 62, thermal time delay relays for energizing and de-energizing, respectively; 52X, auxiliary contactor

primarily for use with a remote controlled oil contactor, it can be used with any oil contactor which is designed to be energized while in the closed position, and which does not require a current in excess of the rating of the auxiliary relay.

Two ratings of the control device are available. One rating contains an auxiliary contactor rated at 10 amperes; the other has a 25-amp. auxiliary contactor. Automatic controls can also be supplied for use with oil breakers and large banks can be controlled in steps. This simplified form of control is used with pole-mounted distribution capacitors, which are usually located out on circuits where the fault current does not exceed the momentary rating of this oil contactor.

• • •

Dispatching Board Made Locally

By A. R. KASSNER,
Production Manager, The Patchogue Electric Light Co., Patchogue, N. Y.

To duplicate electrically various switching procedures on the transmission system of the Patchogue Electric Light Co., a dispatching board was constructed, using only locally purchased supplies and salvaged parts. Both new and old personnel have been educated more rapidly by the aid of this board than by the more drawn-out procedure of explanations and drawings of the switching setup.

The board was made of 4 ft. x 6 ft. Masonite, $\frac{3}{16}$ in.-thickness, and the natural brown color was retained. A 2-in. box along the outer edges keeps the board 2 in. from the wall to allow space for lighting from the rear.

The transmission system was sketched on the board in chalk, as a guide. Representations of airbreak switches were made of 40-lb. picture hooks which required only slight reshaping. Contacts were made of brass rivets. Oil circuit breakers were represented by flush toggle switches. Machine screws, washers, grommets, etc., used to mount the switches were parts salvaged from scrap watthour meters.

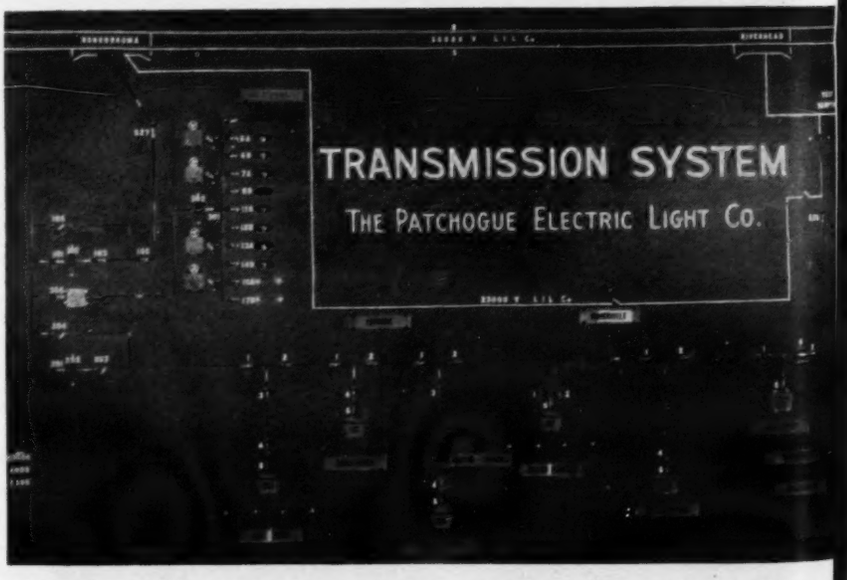
First operation was the mounting of the switches. Then slots were cut for the transmission and main distribution feeders. These slots were made by using three hacksaw blades clamped together in a compass saw handle. The cuts were the correct width to push in snug-fitting, colored cellophane drinking straws, known as Glassips. These colored straws indicate the various voltages. Some transmission lines of another company with which the Patchogue Co. is tied in for emergency service were laid out with gummed tape.

Substations were represented by a piece of frosted glass inserted in a $1\frac{1}{2}$x$1\frac{1}{2}$-in. cutout and held in by paper fasteners. Municipalities were indicated in similar fashion except that the cutout is 1 in. x 5 in. Lettering is by means of gummed letters. Local circuits were represented by bull's-eyes which were automobile license plate holders with the back drilled out and a lamp placed behind them. Line fuses were cartridge type automobile fuses; clips are scrap spring brass.

Lighting Supplied

Lighting was accomplished by using either one 14-volt bulb, two 6-volt bulbs in series or four 3-volt bulbs in series, depending on the length of line to be illuminated. Each section of line, or locality, was incased in a separate box and the wiring was arranged to coincide with the switches on the front of the board. Power at 12 volts for the lamps is obtained from the d.c. signal batteries in the plant.

To simulate a generator being placed on the line, a small meter gear projects through the board and operates, when turned one-half turn, an internal switch to control and illuminate the section that is marked with the number and capacity of the generator. This gear wheel would correspond to the steam header valve.



DISPATCHING board made of local supplies; localities and lines lighted from rear

New INTERNAL-PIVOT PANEL INSTRUMENTS

2½- inch—1 inch deep

For radio and other communications service: Type DW-51 d-c voltmeters, ammeters, milliammeters, and microammeters; Type DW-52 radio-frequency ammeters (a-c thermocouple-type). Cases are brass or molded Textolite.

A New Design That Puts More Instrument into *Less* Space

These new, internal-pivot instruments were developed to fill a vital need—particularly in the radio and aircraft fields—the need for compactness. They are *thin*—in most ratings, less than 1 inch deep.

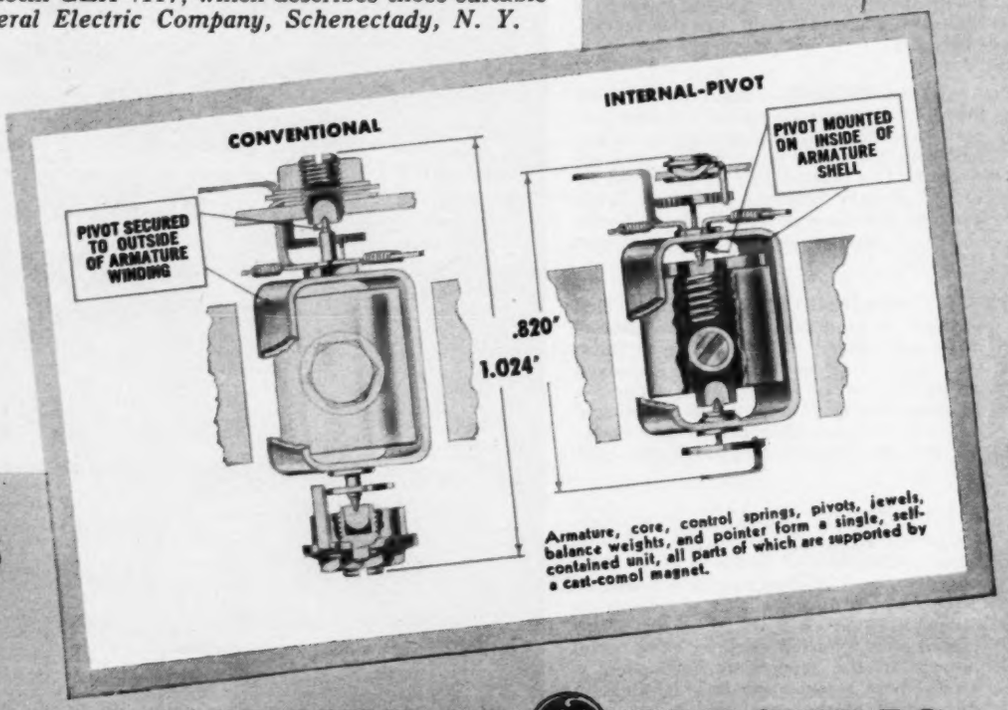
More important is the way their thinness was achieved. In the sketch below, see how the pivots are solidly anchored to the *inside* of the armature shell so they cannot work loose. The moving parts are permanently aligned with stationary parts by bolting the core assembly to a one-piece cast-comol magnet.

Other features are: large-radius pivots, high torque and good damping, lightweight moving element, and ample clearances. Added up, they give you an instrument well able to withstand vibration and hold its rated accuracy, one that is fast on response and easy to read accurately—a design that packs all-round fine performance in a small space.

For ratings, price, and dimensions, ask our nearest office for Bulletin GEA-4064, which covers instruments for radio and other communications equipment; or Bulletin GEA-4117, which describes those suitable for naval aircraft. *General Electric Company, Schenectady, N. Y.*

Type DW-53 d-c voltmeters, ammeters, and volt-ammeters that are specially designed to measure voltage and current in battery and battery-charging circuits on naval aircraft. They meet applicable Navy specifications.

Invest in your future
BUY WAR BONDS


CONVENTIONAL
INTERNAL-PIVOT
PIVOT SECURED TO OUTSIDE OF ARMATURE WINDING
PIVOT MOUNTED ON INSIDE OF ARMATURE SHELL
.820"
1.024"
Armature, core, control springs, pivots, jewels, balance weights, and pointer form a single, self-contained unit, all parts of which are supported by a cast-comol magnet.

HEADQUARTERS FOR ELECTRICAL MEASUREMENT

GENERAL ELECTRIC

FAULT LOCATION ON NON-METALLIC SHEATH CABLE

By H. N. EKVALL, Engineering Department, Philadelphia Electric Co.

The Communications Committee of the Pennsylvania Electric Association at the request of the Electrical Equipment Committee recently undertook a study of various methods for locating faults in non-metallic sheath power cables and control wiring. A brief resume of this study places the various fault locating methods into three groups. The first two groups, Electric Pick Up Methods and Bridge Methods, were presented in Electrical World, April 1, 1944 issue, page 82, and April 29, 1944 issue, page 90, respectively. The third group, Miscellaneous Methods, is presented below and concludes this series.

GROUP III—MISCELLANEOUS METHODS

NOTE: The schemes described here are rather limited in their application and have the disadvantage of requiring digging one or more holes to make the tests. While the illustrations are for rural concentric cable, the methods are applicable to non-metallic sheath cable.

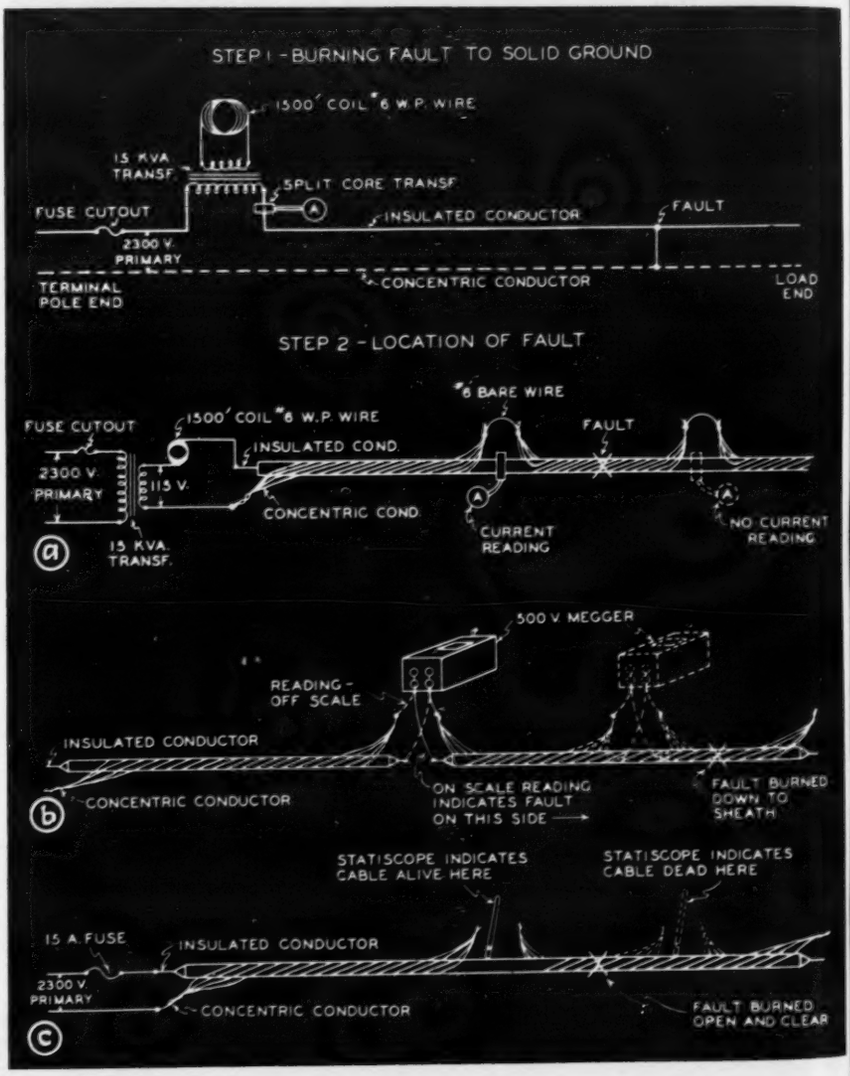
(a) SPLIT CORE METHOD—Step 1 shows the method of burning down the fault to a low resistance between conductor and concentric sheath.

Step 2 shows a hole dug at approximately the halfway mark. Here the concentric strands are cut and unwrapped for 6 in. and pigtailed. A split core transformer is placed around the uncovered section of cable. Approximately 10 amp. at 110 volts is put on the cable. If no current is read on ammeter, the fault is toward the testing transformer, but if current is read the fault is in the opposite direction. This halving process is repeated until the fault can be readily excavated.

(b) MEGGER METHOD—After burning the fault down to a fairly low resistance, the cable is opened up at the half way point and meggered in each direction. The faulted half, as indicated by a low megger reading, is halved again and the process repeated until the faulty section is short enough to excavate economically.

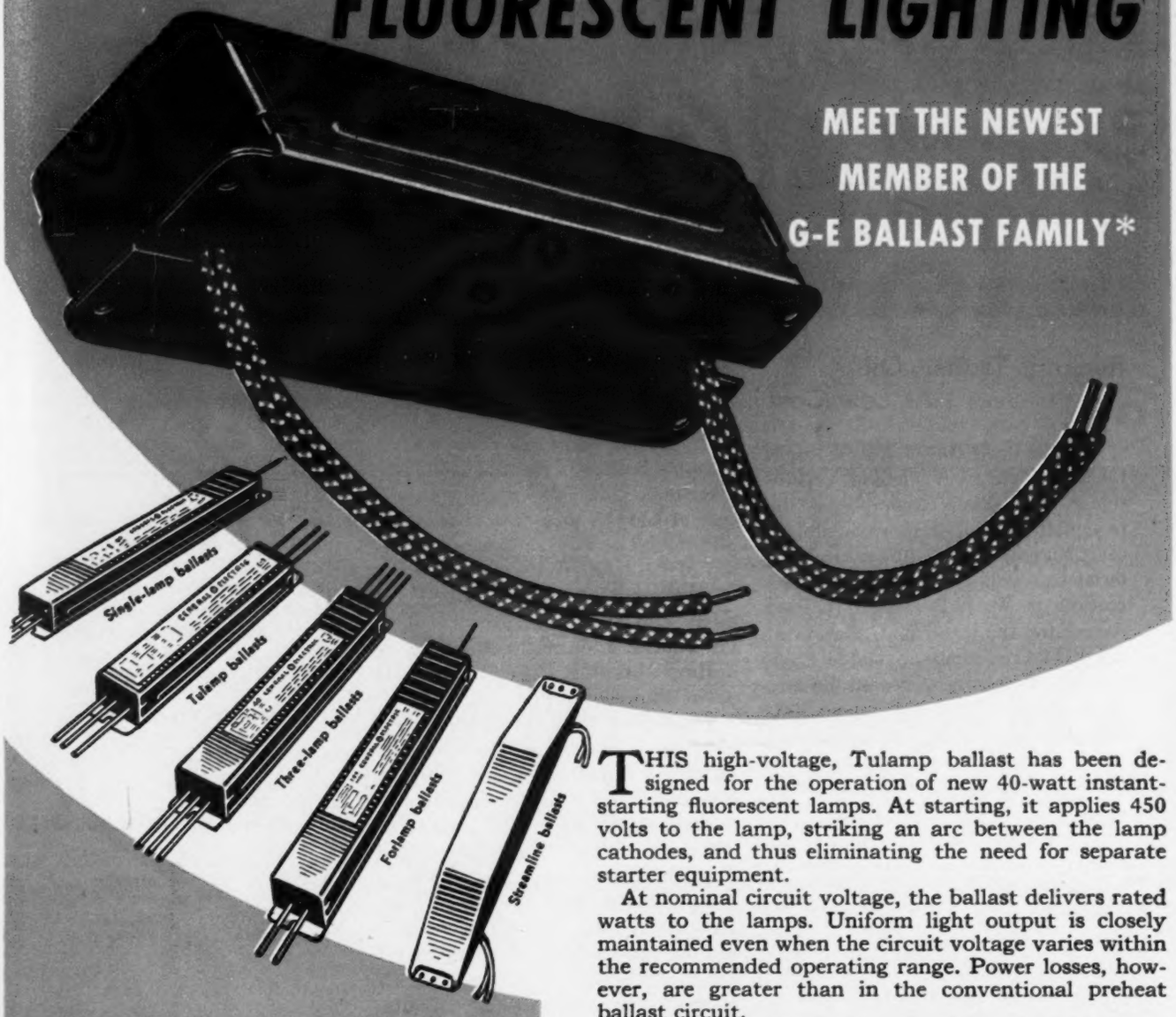
(c) STATISCOPE METHOD—This method is used if the cable is burned open and clear. At the half way point the concentric conductor is removed enough to test the cable with a statiscope. If alive, the open has not been reached and vice versa. Repeat tests are made, halving the live sections until the fault is found.

(d) FISHER M-SCOPE FOR LOCATING BURIED CABLES (no diagram)—This device consists of a small portable loop transmitter and loop receiver, which may be used separately or joined together on a frame. When transported over a buried cable or other metal objects in the ground an indication is received on a meter, or head phones, in the output of the receiver. It has been suggested that this device may be made adaptable for fault location on conductors.



for operation of INSTANT-STARTING FLUORESCENT LIGHTING

MEET THE NEWEST MEMBER OF THE G-E BALLAST FAMILY*



THIS high-voltage, Tulamp ballast has been designed for the operation of new 40-watt instant-starting fluorescent lamps. At starting, it applies 450 volts to the lamp, striking an arc between the lamp cathodes, and thus eliminating the need for separate starter equipment.

At nominal circuit voltage, the ballast delivers rated watts to the lamps. Uniform light output is closely maintained even when the circuit voltage varies within the recommended operating range. Power losses, however, are greater than in the conventional preheat ballast circuit.

Like all other G-E Tulamp ballasts, this design provides high power factor and gives excellent correction of cyclic light flicker. Special filters for suppression of radio interference are incorporated.

The new high-voltage ballast is currently available in Tulamp 40-watt ratings for use on 118-volt circuits. It is housed in a standard-sized, universal case that allows the leads to be brought out the end or bottom, permitting great flexibility of installation and complete utilization of present fixture designs.

This ballast development, as well as the recent introduction of G-E MAZDA F lamps for instant-starting circuits, is just one more example of the never-ending lighting progress led by General Electric research.

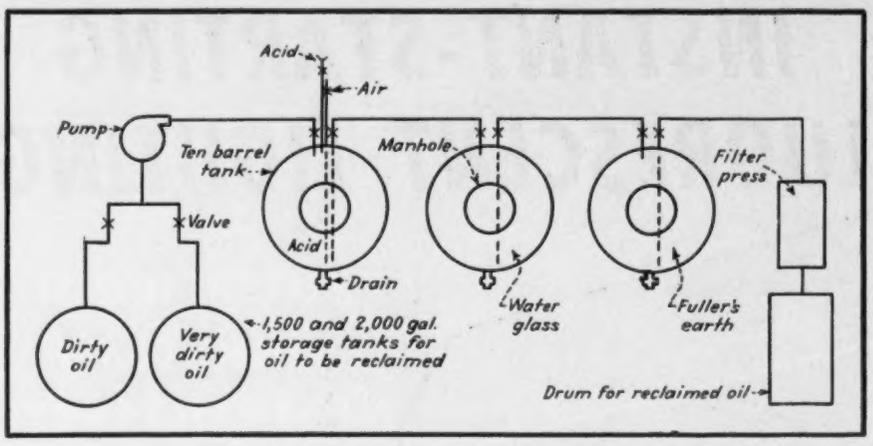
For further information, including diagrams of instant-starting circuits, ask our nearest office for Supplement No. 2 to publication GEA-3293E. Or write to General Electric Co., Schenectady 5, N. Y.

* THIS new, high-voltage ballast, an addition to our diversified line, will find its most advantageous use only where instant starting is a definite benefit.
Pictured above are representative types of G-E ballasts for the conventional preheat system. For most installations, such ballasts are still the most economical and efficient method of operating fluorescent lamps. Steady improvement in G-E MAZDA F lamps, and the use of the new G-E Watch Dog starter to prevent flicker, combine to assure ever greater acceptance of the preheat system of lamp operation.

BALLASTS FOR FLUORESCENT LIGHTING

GENERAL ELECTRIC

408-23-5205



FLOW DIAGRAM of oil reclaiming process. A fourth tank (not shown, at right) has been installed in the plant to enable a larger quantity of work to be carried on in a given time

Reclaim Transit Oil At Low Cost

New Bedford Gas & Edison Light Co.'s sulfuric acid method expeditiously and safely accomplishes the reclamation of oil at approximately 6 cents per gallon, with little critical material and with simple equipment, according to W. J. Bridegam (Gilbert Associates, Inc.) and W. G. Barlow at the 1944 Conference of Doble Engineering Company Clients, Boston, Mass. About 10,000 bbl. (some 500,000 gal.) of oil from distribution and power transformers have been reclaimed since the method was developed by E. H. Steele* in 1928.

The process, similar to that at the refinery when the oil is first produced, is as follows:

First Step—Oil is pumped, as required, from either storage tank outside the plant by a small two-inch pump into the acid treatment tank in the reclaiming room. This tank holds a little more than 400 gallons. Space is left to accommodate from 3 to 5 gallons of commercial sulfuric acid, the amount depending on the condition of the oil to be treated. After the addition of the acid, a half-inch air hose is lowered through a port in the top of the tank to within a half-inch of the bottom, and air under about three pounds pressure is turned on. This starts a churning motion which is maintained for about 30 minutes. During this process, the tank is vented to the outside atmosphere through a two-inch pipe line. After the churning, the oil is allowed to stand over night.

Second Step—The next morning, air pressure is applied to the surface of the oil forcing it through a drip pipe (the end of which is four inches from the bottom of the tank) into another tank. Five or six gallons of silicate of soda is then poured into the oil through a two-inch opening in the top of the tank. The same procedure of churning by air is repeated for thirty minutes. Tanks are vented to the outside atmosphere at all times during churning. The mixture is again allowed to settle overnight.

Third Step—Air pressure is again used the following day to move the oil into a third tank, about 100 gallons being taken over initially. To that quantity 100 to 150 pounds of 200-mesh fuller's earth is added through a manhole. The earth is worked into the oil with a hoe to form a plastic mixture. The manhole cover is then replaced and the balance of the oil is forced over. Compressed air is again used to churn the mixture, the air pipe being moved about to assist in the process. Also, to assist in getting as much of the earth into suspension as possible, the churning time is increased. The charge is allowed to settle overnight.

Fourth Step—The following day the oil is drawn off, starting the withdrawal at the top and lowering the suction pipe until the oil level is below the manhole. The draw-off is through a seven-inch filter press, having five sheets of paper per press section, a change being made in each 400-gal. run. The cover is then removed to enable the operator to watch the suction hose, the object being to disturb the settled-out earth at the bottom of the tank as little as possible. With care, most of the oil can be drawn off leaving a heavy sludge of fuller's-earth on the bottom of the tank. This sludge is later removed and placed in a sand filter to drain. The hard fuller's-earth cake which remains in the filter is thrown away as it is cheaper to buy new earth than to reclaim the old.

After filtering the oil is immediately discharged into clean 50-gal. drums. Shrinkage averages about six percent or 24 gal. for each 400-gal. batch.

The oil averages a No. 2 N.P.A. color, but can be brought to a No. 1 color by a second treatment with fuller's-earth.

Tanks are cleaned out after every batch by drawing off the sludge through 3-inch plug cocks which are welded to the lower ends of the inclined tanks. Manhole covers are removed and any remaining solids are scraped out.

Dielectric tests are made on the oil in each drum and averages 28 to 30 kv., a 33-kv. testing transformer being used. The alkali blue acidity test is used, the working medium consisting of an alcohol-benzal mixture. This is titrated cold with N/100 KOH solution.

The average acidity number for oil reclaimed by the process is the same as new oil; i.e., 0 to 0.05 mg. KOH/g. using the alkali blue test.

Approximate Unit Cost of Materials

Oil of vitrol (93%), gravity 1.84, at 0.025 per pound, about 16 pounds per gallon, cost per gallon	$ 0.40
Silicate of Soda (water glass), (30%) 1.365 gravity, cost per gallon	.18
200 mesh fuller's earth, cost per ton	($13.00)
Freight, cost per ton	(20.00)
Material costs to reclaim 400 gallons of oil:	
Acid, 4 gallons, average	$1.60
Water glass, 5 gallons, average	.90
Fuller's earth, 150 pounds	2.48
Paper for press	.50
Oil shrinkage, 24 gallons at $0.30 per gallon	7.20
Labor	10.00
Maintenance, light and power	1.00
	$23.68

Average cost—about $0.06 per gallon for reclaiming.

*Now Chief Electrical Engineer, New England Gas & Electric Association, Cambridge, Mass.

PHILCO *Floté* Batteries

FOR LONGER LIFE
HIGH ELECTRICAL EFFICIENCY

THE long service life and high electrical efficiency of Philco Floté Batteries is a direct result of the Philco Floté grid design and the special metal in which it is cast. Because a minimum of metal is exposed on the plate surface, peroxidation is materially retarded. The grid design and structure (as shown in the cutaway section below) not only provides exceptional strength, but produces superior electrical efficiency.

Philco Floté grids are cast in a special metal which reduces by as much as 40% the amount of current necessary to maintain the charge in full float operation!

For complete information and engineering specifications, write for the latest Philco Floté Battery catalog.

Philco Corporation, Storage Battery Division
Trenton 7, New Jersey

END VIEW OF PHILCO FLOTÉ POSITIVE GRID SHOWING CROSS SECTION OF CONSTRUCTION

A—MASTER EFFICIENCY CONDUCTOR "A". Taper provides extra surface for lower resistance and exposes a minimum of metal on the surface of the plate.

B—MASTER EFFICIENCY CONDUCTOR "B". An equalizer on both charge and discharge. Affords superior locking of active material. Through-members run in direction of lug.

C—SMALLER FLOTÉ GRID MEMBERS. Run only from left to right, furnishing perfect grid balance and adding to overall electrical efficiency.

D—TRIPLE DIAGONAL CONDUCTORS. Close combination of two light members and a heavy through-member improves conductivity and adds to service life.

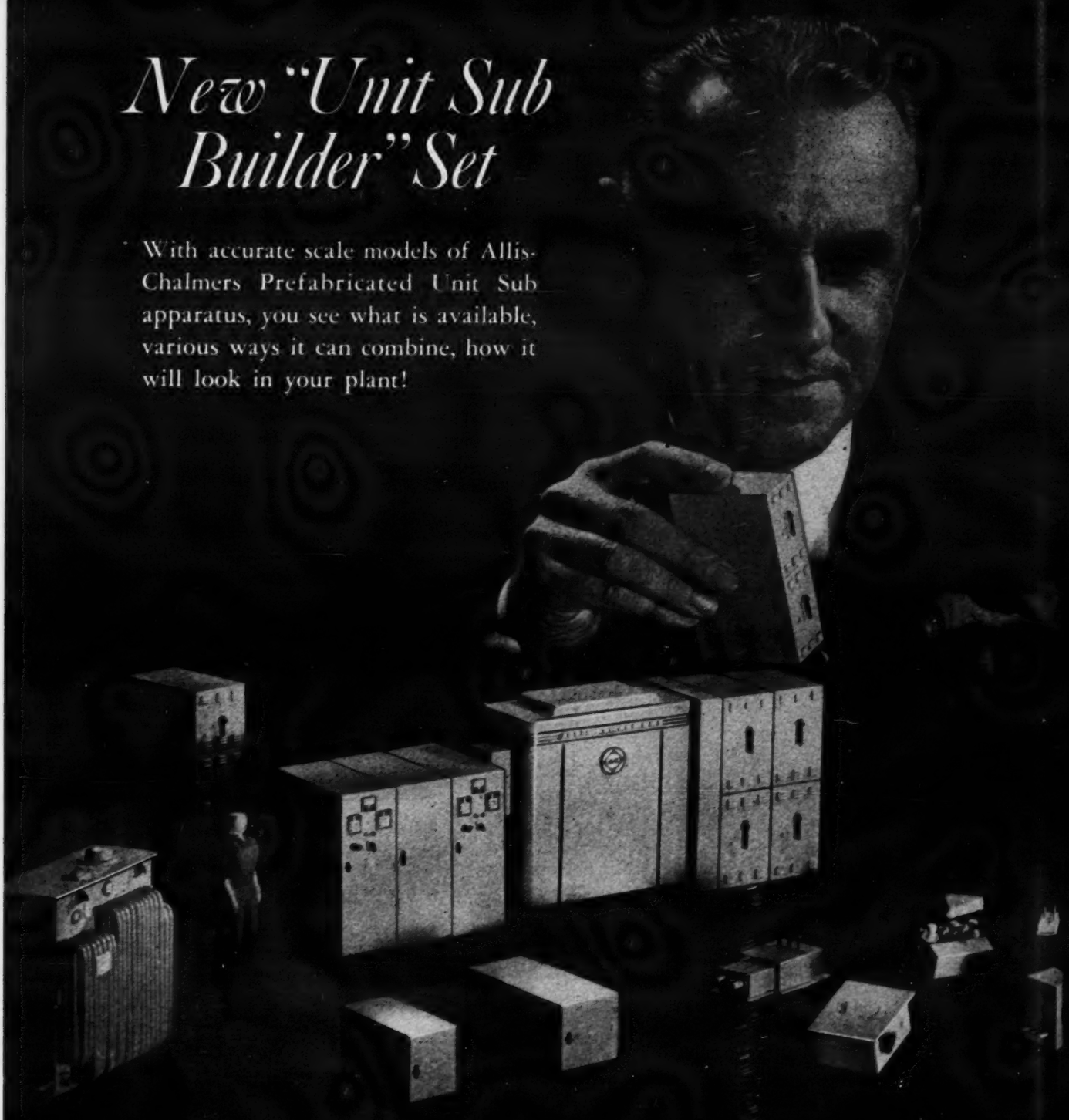
E—EXTRA HEAVY GRID FRAME. Surrounds the internal Floté members for maximum structural strength and durability.

Specify PHILCO *Storage Batteries*

Now--Simplify You
with Industry'

New "Unit Sub Builder" Set

With accurate scale models of Allis-Chalmers Prefabricated Unit Sub apparatus, you see what is available, various ways it can combine, how it will look in your plant!



YOU

ALLI

Unit Sub Planning Newest Aid!

GUESSWORK IS GONE from unit sub planning when you *see* the elements of Allis-Chalmers Prefabricated Unit Substations — in accurate scale models.

You plan *visually,* effortlessly — without bogging down in charts, tables, diagrams — save time, cut way down on any chance of error.

To see for yourself how the new "Unit Sub Builder" Set can help you in your power distribution planning, call your nearby Allis-Chalmers district office.

An A-C field engineer will bring the models, together with the handy new "Unit Sub Slide Rule" for calculating breaker capacity — and new "Check List" for *double* checking all details. ALLIS-CHALMERS, MILWAUKEE 1, WIS.

• • •

♪ *Tune in the famous Boston "Pops", Blue Network, Saturdays at 8:30 pm, EWT.*

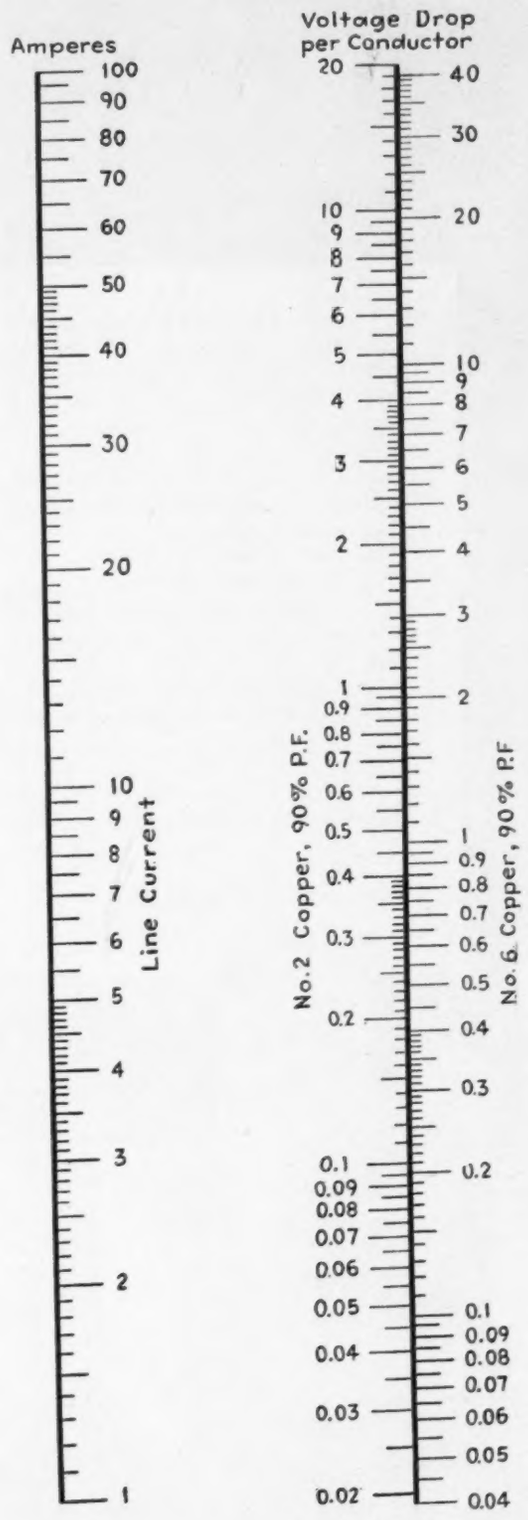
A 1746

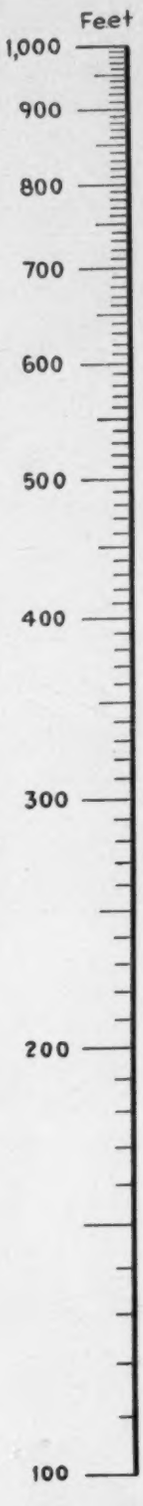
YOUR UNIT SUB IDEAS WORKED OUT WITH

HALMERS *"Unit Sub Builder" Set*

How To Determine Voltage Drop

Chart prepared by Hugh Lawyer, Oklahoma Gas & Electric Co.





Voltage drop in a conductor carrying a given current is given by the equation:

$$Vd = \frac{I\,(R\cos\theta + X\sin\theta)\,D}{1{,}000}$$

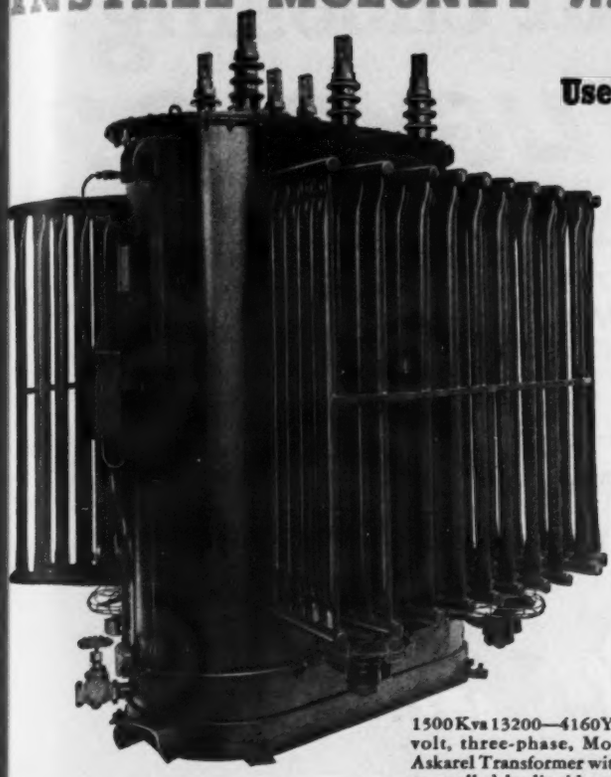
where Vd = Voltage drop
I = Line current, amp.
R = Resistance of conductor ohms per 1000 ft.
X = Reactance of the conductor, ohms per 1000 ft.
D = Length of line, feet
θ = Power factor angle

This equation is solved by the accompanying chart for the special cases where line conductors are either No. 2 or No. 6 copper and power factor is 90 percent. For this assumption the term ($R \cos \Theta + X \sin \Theta$) varies for No. 6 wire from 0.4147 for 8-in. conductor spacing to 0.4338 for 53.2 in. spacing. The value 0.42 has been used in this chart. For No. 2 wire the term varies from 0.1994 to 0.2094 with 0.2 used on this chart.

To use the chart, under the conditions imposed by the assumptions, lay a straight edge from the current value on the "load" scale to distance scale and on the appropriate side of the voltage drop scale read voltage drop per conductor for the proper conductor size. For lines longer than 1,000 feet the value of voltage drop can be approximated by finding the drop per 1,000 ft. and multiplying this value by the number of thousand feet in the line. Drops caused by currents in excess of the chart value may be easily solved by using the 100 point on the line-current scale and then multiplying the result by amperes÷100.

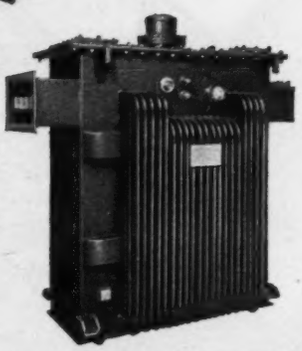
FOR *SAFETY* AND *ECONOMY*—

INSTALL MOLONEY *ASKAREL TRANSFORMERS*



1500 Kva 13200—4160Y/2400 volt, three-phase, Moloney Askarel Transformer with fans controlled by liquid temperature for increasing capacity.

1000 Kva 2400—240 x 480 volt Askarel Transformer with HV selector type disconnect switch and terminal chamber equipped with two sets of cable connections to provide a preferred and emergency feeder to the transformer.



500 Kva 4160—208Y/120 volt, three-phase, sixty cycle, Askarel Load Center Transformer with throats for connection to primary and secondary switchgear.

Used Where Non-inflammable Transformers are Required—Either Indoors or Outdoors

MOLONEY Askarel Transformers are cooled and insulated with Askarel, a non-inflammable liquid. Because of this fact, these transformers are suited to use in applications where oil-cooled transformers would be hazardous to life and property.

Askarel Transformers are ideally adapted to indoor installation in hospital, school, hotel, theatre, office and apartment buildings—in industrial plants, mills and in central stations. They are of weatherproof construction and may be used in outdoor installations. These include in mines, on roofs of buildings, in street and sidewalk vaults for a-c network systems and many other applications where oil-cooled transformers might constitute a hazard.

These transformers effect savings in initial installation costs due to the elimination of expensive fireproof vaults. By locating the transformers at the center of the electrical load, further economies are effected by eliminating long, expensive runs of secondary copper and by providing improved voltage regulation. Moloney Askarel Transformers are available in the same ratings as oil-cooled transformers.

☆ ☆ ☆

Askarel has been approved by the Underwriters' Laboratories for use as an insulating medium and the National Electrical Code permits the installation of Askarel filled transformers indoors without the necessity for providing a fire-proof vault.

MOLONEY ELECTRIC COMPANY
St. Louis, U. S. A.

MOLONEY *ASKAREL* (NON-INFLAMMABLE LIQUID-COOLED) *TRANSFORMERS*

In a stew about choosing FLUORESCENT LIGHTING?

I LIKE THE CONVENTIONAL SYSTEM WITH FS-4 STARTERS
MAKE MINE THE CONVENTIONAL SYSTEM WITH G-E WATCH DOG STARTERS
HOW ABOUT THIS NEW INSTANT-STARTING WITH G-E LAMPS AND BALLASTS?

AN EXTRA WAR BOND IS AN EXTRA SHARE YOU HOLD IN AMERICA'S FUTURE

Then consider these facts

EVER since fluorescent lighting was first introduced by General Electric in 1938, it has been our policy to make a complete line of fluorescent lamps and the ballasts, starters, and sockets for their use. G-E Research is working constantly to improve fluorescent accessories and to find better ways to use them. In buying fluorescent equipment, the following cost factors should be considered:

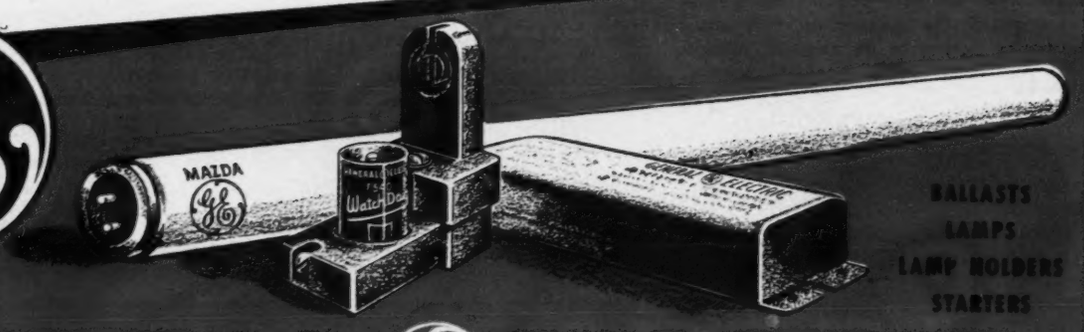
FIRST COST The conventional FS-4 starter system has the lowest initial cost, the G-E Watchdog Starter system costs approximately 2% more, and the Instant-Starting system costs from 15% to 25% more.

OPERATING COST The FS-4 starter system and the G-E Watchdog system have the same operating cost, while the Instant-Starting system costs approximately 13% more to operate because ballast losses are inherently higher.

MAINTENANCE COST For each dollar spent in maintaining the Instant-Starting system, you will spend about $1.05 for the G-E Watchdog Starter system and about $1.09 for the conventional FS-4 system.

The respective advantages of each system are shown here to help you determine the one which best fits your needs. Whatever system is selected, you can depend on General Electric lamps, ballasts, starters and lamp holders to provide the utmost in fluorescent lighting service.

For an illustrated booklet giving further facts, figures, and a complete comparison of the operating characteristics of the three fluorescent systems, write General Electric at any of these addresses: Nela Park, Cleveland 12, Ohio; Boston Avenue, Bridgeport 2, Conn.; 1 River Road, Schenectady 5, N. Y.

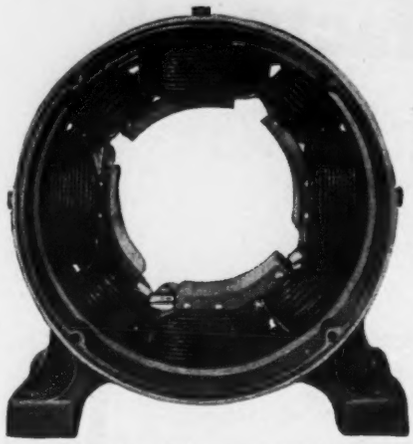


BALLASTS
LAMPS
LAMP HOLDERS
STARTERS

GENERAL ELECTRIC

Hear the General Electric Radio programs: "The G-E All-Girl Orchestra" Sunday, 10 p.m. EWT, NBC; "The World Today" news, every weekday, 6:45 p.m. EWT, CBS.

The E. P. DIVERTER POLE MOTOR GENERATOR

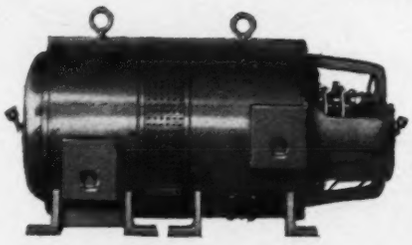


DIVERTER POLE CONSTRUCTION

Equipment Especially Designed for Charging Oil Switch Batteries To Assure Constant Voltage And Extend Battery Life

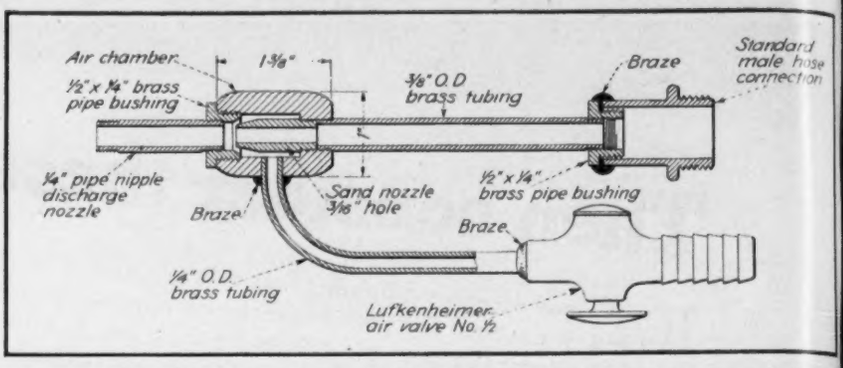
The Diverter Pole Generator . . . . .

• Insures constant exchange voltage within very close limits on 24 hour continuous duty. This constant charging also insures, at all times, the proper rates essential to secure best battery performance. • The compact two bearing construction reduces maintenance and conserves mounting space. The armature is scientifically balanced on anti-friction bearings. Only a gentle movement of air is necessary for adequate cooling to reduce mechanical noises. • It is capable of delivering its rated current capacity at a sufficiently high voltage to accomplish a quick re-charge of the battery following any prolonged power interruption, as well as for an occasional overcharge. • It is free from any characteristics of "running away" or reversal of polarity in case of power discharge from the battery into the generator. • It *automatically* transfers to the battery any current demands beyond the normal capacity of the generator. • It *automatically* returns to its original voltage when the load drops back to normal.



Write for Bulletin 96 giving full details.

The Electric Products Co.
1739 CLARKSTONE ROAD - CLEVELAND 12, OHIO



BY ADMITTING SAND through straight pipe and air at an angle there is less wear on sandblast nozzle than with the conventional reverse of this arrangement. All parts of brass; air chamber is 1-inch octagon bar. Sand and discharge nozzles replaceable

Improved Nozzle for Sandblasting Meters

By CHARLES E. MEYERS and JOHN HASTINGS

San Joaquin Power Division, Pacific Gas & Electric Co., Fresno, Calif.

It has been the practice in the meter shop of the San Joaquin division, Pacific Gas & Electric Co., to use a sandblast for roughing space on glass meter covers for index numbers, for cleaning rusty or dirty meter parts preparatory to painting and for other general usages. Recently a distinct improvement has been made in the assembly of the sandblast nozzle which has increased its life and effectiveness.

The assembly displaced was the reverse of the one illustrated, with sand coming in from the side and the air pipe running straight from the end of the mixing chamber. The sand having to make a bend caused excessive wear on the sand pipe. There was also excessive wear in the mixing chamber due to the air and sand mixing there before passing to the nozzle.

In the new assembly the air is admitted from the side and the sand through the straight pipe as shown. This nozzle is more effective, will have much greater life and has greater suction as well. The sand is drawn in rather than having to depend upon gravity feed. An air pressure of 150 lb. is used which does a nice job with wear and tear greatly reduced.

• • •

Limit on Capacitor Switched with Motor

By W. C. BLOOMQUIST

Industrial Power Division, General Electric Co., Schenectady, N. Y.

It is usual these days to apply capacitors at the terminals of an induction motor and to switch the capacitors with the motor to eliminate a separate switching device. Capacitors applied directly to the motor terminals are an ideal application since the benefits of the reduced-line current (feeder loading and copper losses) extend all the way back to the power source. However, there are certain limitations to this arrangements which should be recognized: (1) motor overvoltage due to self-excitation; (2) possibility of high transient torques, and (3) thermal protection of the induction motor.

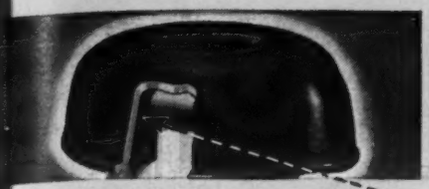
If too much capacitor kva. is connected to the motor terminals the induction motor will self-excite and act as a generator and sustain an overvoltage condition when the motor starter switch is opened. This is most pronounced on loads with a high WR^2 since the unit tends to maintain a constant speed.

A safe application rule is to apply capacitors to the extent of improving the full-load motor power factor at rated voltage to 95-96 percent. This will keep the voltage rise within the 10 percent of nameplate rating. Another way of stating this rule is to apply capacitive kva. to equal the motor magnetizing requirements at 110 percent of the motor-voltage rating.

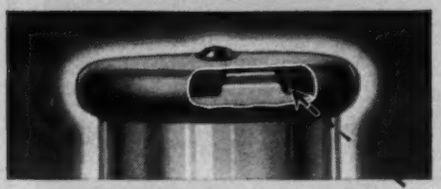
If improvement to a higher power factor is desired, it is necessary to

6 Seals Against Moisture

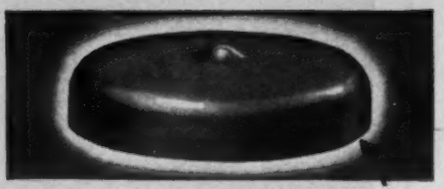
THIS IS WHY L-M LIGHTNING ARRESTERS INSURE PERMANENCE OF PROTECTION • LOW REPLACEMENT AND OUTAGE COSTS . . .



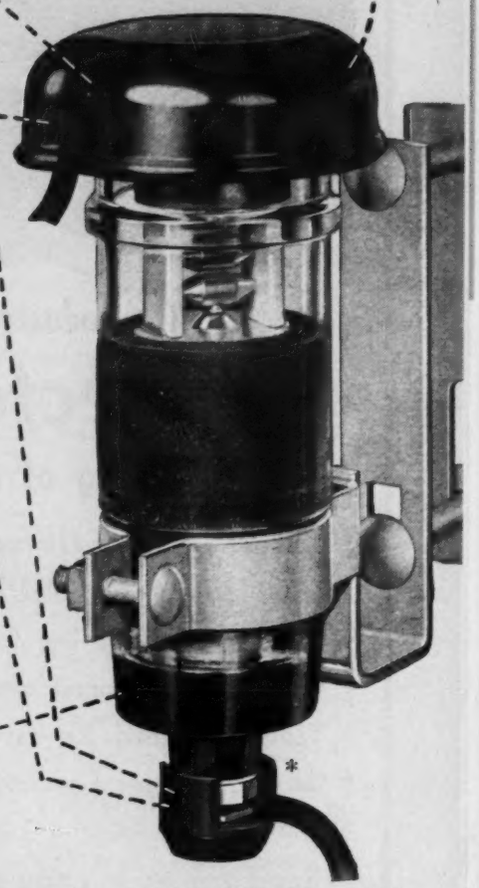
The space between the arrester housing and the glass cap is filled with a weather resisting sealing compound.



A synthetic rubber gasket is placed around the top of the glass housing and compressed into position under pressure and is held in place by the copper cap.



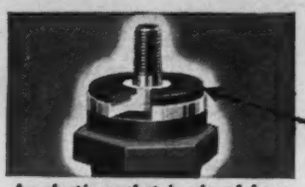
This copper cap seals the top of the housing. It is spun onto the glass housing.



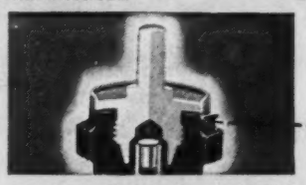
While only two seals—one at the top of the housing and one at the bottom—are actually necessary, Line Material takes further precautions to make L-M Lightning Arresters moisture-proof by literally "sealing the seals."

Note how the copper cap at the top, the two gaskets between the Isolator and the housing, and the sealing compound further protect the arrester against moisture. These 6 seals are your assurance of permanent protection, the elimination of frequent replacements and a consequent reduction in outage costs.

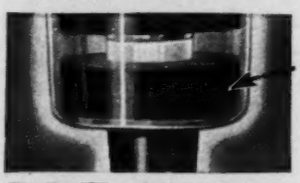
For further details as to the design and construction of L-M Lightning Arresters send for Bulletin 40151. Line Material Company, Milwaukee, Wisconsin.



An elastic gasket is placed in a recess between the exterior portion of the housing and the upper surface of the ground lead electrode and is locked into position by the nut which locks the ground lead electrode.



Another sealing gasket is placed between the Isolator body and the bottom surface of the ground lead electrode.



Finally, the entire concave area between the housing and the Isolator is also filled with a sealing compound of the same character as that employed at the top.

***THE ISOLATOR . . . AN EXCLUSIVE L-M FEATURE PAT. NO. 2,315,320**

MEETS THE NEW NEMA STANDARDS

These three Oscillogram photos show how L-M Lightning Arresters meet the new NEMA standards. Fig. 1 shows operation characteristics before 5,000 ampere operating cycle test of a 3 Kv Arrester. Fig. 2 shows characteristics after the 30th shot. Fig. 3 shows the unchanged characteristics after single 65,000 ampere surge as required by new NEMA standards.

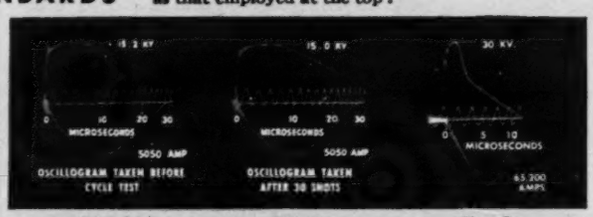


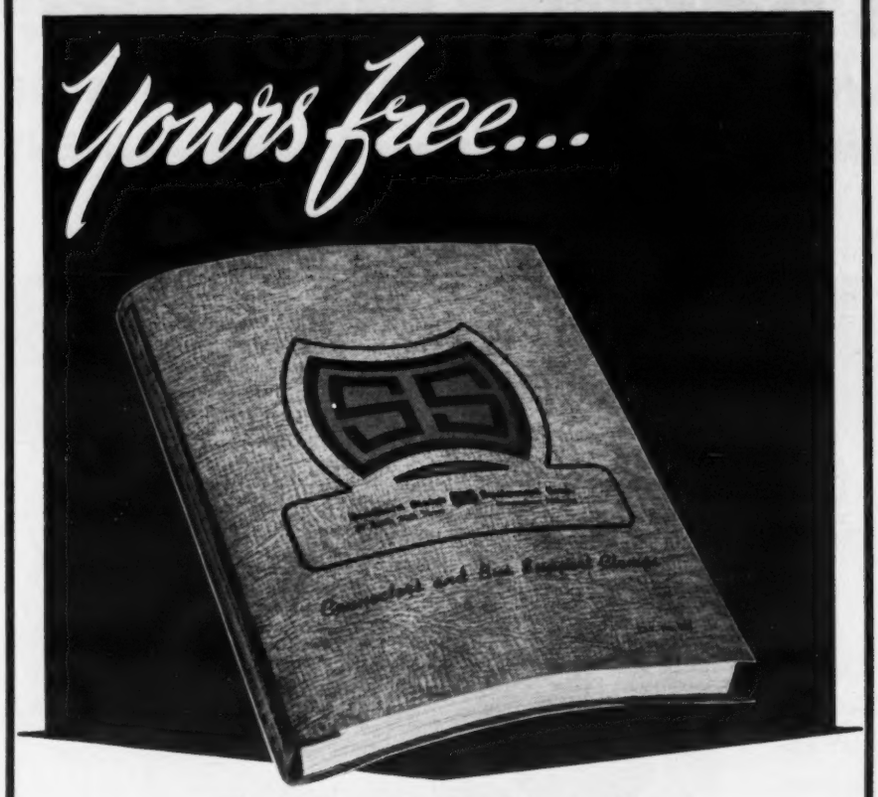
Fig. 1 Fig. 2 Fig. 3

SIZES:

L-M Lightning Arresters are made in 6 sizes with ratings ranging from 1 to 15 Kv.

LINE MATERIAL
LIGHTNING ARRESTERS

L-M DISTRIBUTION EQUIPMENT INCLUDES: Distribution Transformers • Fuse Cutouts and Fuse Links • Lightning Arresters
Oil Switches • Pole Line Hardware • Line Construction Specialties • Underground Equipment • Fibre Conduit • Street Lighting Equipment



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- Tables designed for easy readings.
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"One Fuse Link or a Complete Substation"

switch part of the capacitor bank separately. Usually the separately switched bank is connected to the line side to take advantage of diversity of load and utilize the capacitor bank 100 per cent of the time. In all cases where capacitors and induction motors are considered as an alternative to either a 1.0 or 0.8 power-factor synchronous machine for the same power-factor correction, only part of the capacitors can be switched with the motors.

Large capacitor banks at motor terminals may cause excessive transient torques, resulting in damaged couplings and twisted shafts on switching. This effect is most pronounced on motors with reduced-voltage starters, since at the moment of transfer from reduced voltage to full voltage the motor acts as a generator because of the excitation supplied by the capacitor. The voltage and phase relations may differ considerably from the line conditions. This also applies to full-voltage starters where operation may require the starter to be opened and then immediately closed.

We know of no trouble along this line where capacitors were applied to correct the full load motor power factor to 95 percent lagging.

Overload Relay

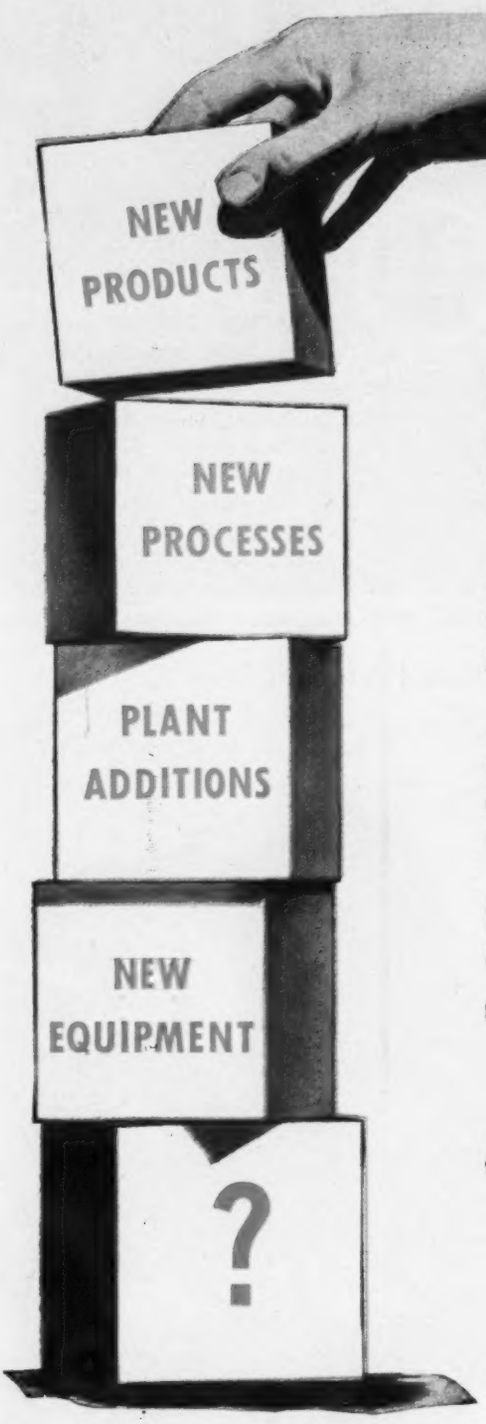
When capacitors are connected to the motor terminals they supply some of the motor-magnetizing requirements, so the actual line current is less than it would be without capacitors. If the motor starter has a standard overload relay, the relay will not provide proper protection to the motor since the heater element was chosen for the full-motor current including the magnetizing component. The heater element or overload relay should be changed to a smaller current rating commensurate with the reduced line current due to the effect of the capacitors.

The intelligent application of capacitors at motor terminals offers no difficulties to proper motor operation if the following are observed:

1. Apply capacitors to the extent of improving the full load motor power factor to 95-96 percent.
2. Refer applications involving reduced-voltage starting to the electrical manufacturer.
3. Check the motor overload relay and replace with a smaller heater element if necessary.

(Here's another ad in the series that brings a vital message to your customers.)

Know where that postwar plan of yours ought to START?

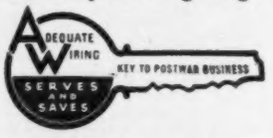


ACTUALLY it *must* start with electrical wiring . . . *adequate* wiring! Not because we think so—but simply because electric energy—electric-motorized power—is going to play an even bigger role in postwar production. And you can't take full advantage of it without the right wiring.

Undoubtedly you want to swing your plant into peacetime production quickly after the war. You've got plans for that—and for modernization . . . improvements . . . possibly expansion.

Well, more and better wiring will have to come first. And now is the time to plan for it—in advance. Just about the most valuable men you could talk to today are your electrical contractor and a power engineer from the local utility plant. *Bring them into the advance planning stage.*

Unwired planning will cost you a whole lot more than *planned wiring!* 44226



HELP BRING VICTORY SOONER . . . BUY MORE WAR BONDS

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Electrical Wires and Cables of Copper are the Life Lines of our Nation

LOAD SERVICING

Commercial
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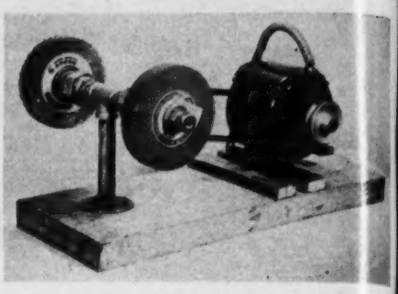
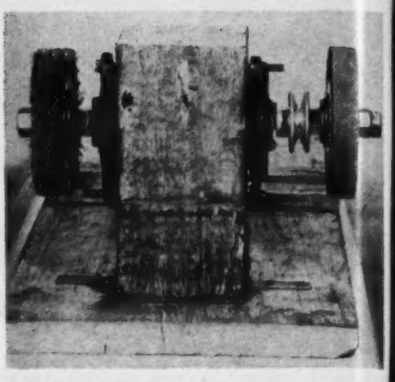




GRINDERS BUILT from easily obtainable parts; using pipe standard (top) and wooden block standard (bottom)

Farmers Given Lift With Gadgets

By W. B. REICHARD
Rural Representative, Pennsylvania Power Co., Greenville, Pa.

During this wartime period farmers can devise electrically operated gadgets that can do the job normally done by commercial appliances. Examples of ingenuity are two types of grinders built from obtainable parts.

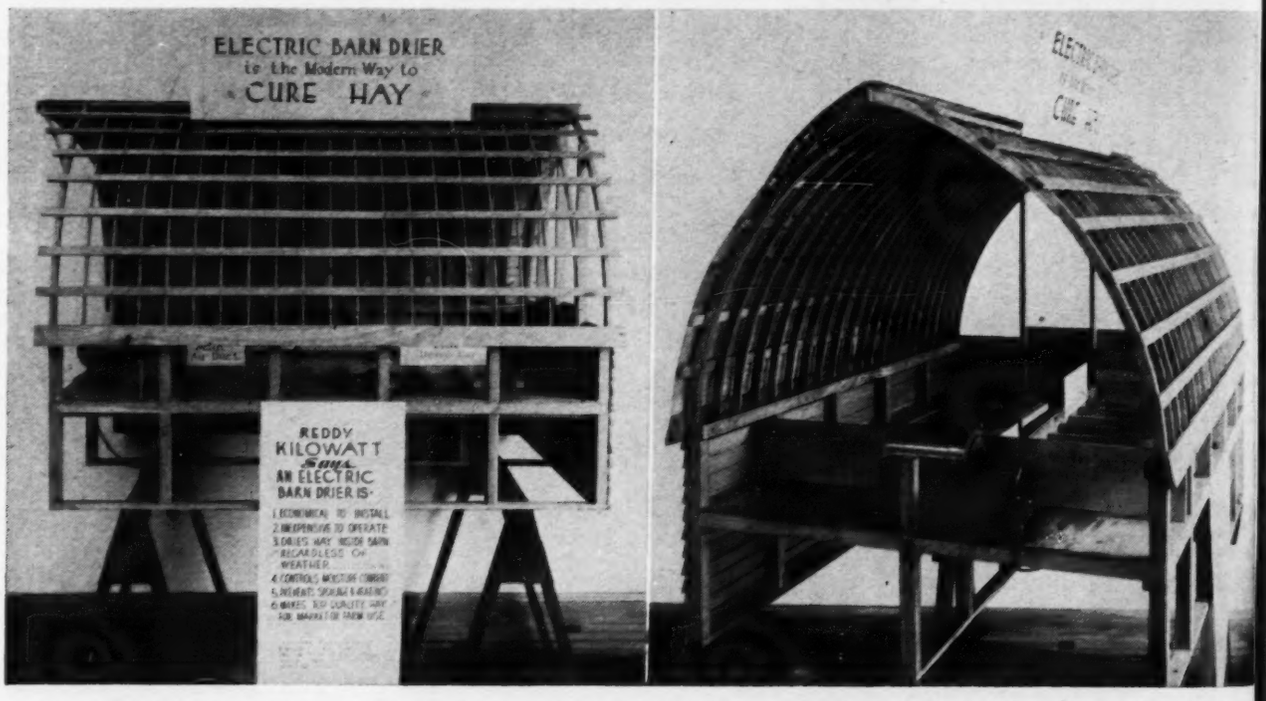
One type of grinder has the stand and main assembly made of pipe and pipe flange; 1¾-in. galvanized pipe nipple 6 in. long; 2¾-in. pipe nipples 2 in. long; 1¾-in. tee; and 2¾-in. lip unions. The unions are used to hold the ball bearings which can be obtained from old automobile generators. The shaft is a piece of a Model T Ford steering wheel shaft 15 in. long and turned down to fit the ball bearings and V-pulley. Standard threads were cut on each end for a distance of 3½-in. to fit a ⅝-in. hexagon nut. Since in both cases right hand threads are used a lock nut is needed on each end to prevent one wheel from loosening. If unable to secure stone flanges to hold the emery wheel and wire brush, two heavy washers can be used on each side of each wheel for this purpose.

A 2½-in. V-pulley is used on the grinder and a 4-in. pulley on the motor. A ¼-hp. portable motor can then be belted to the grinder. This motor may also be used elsewhere.

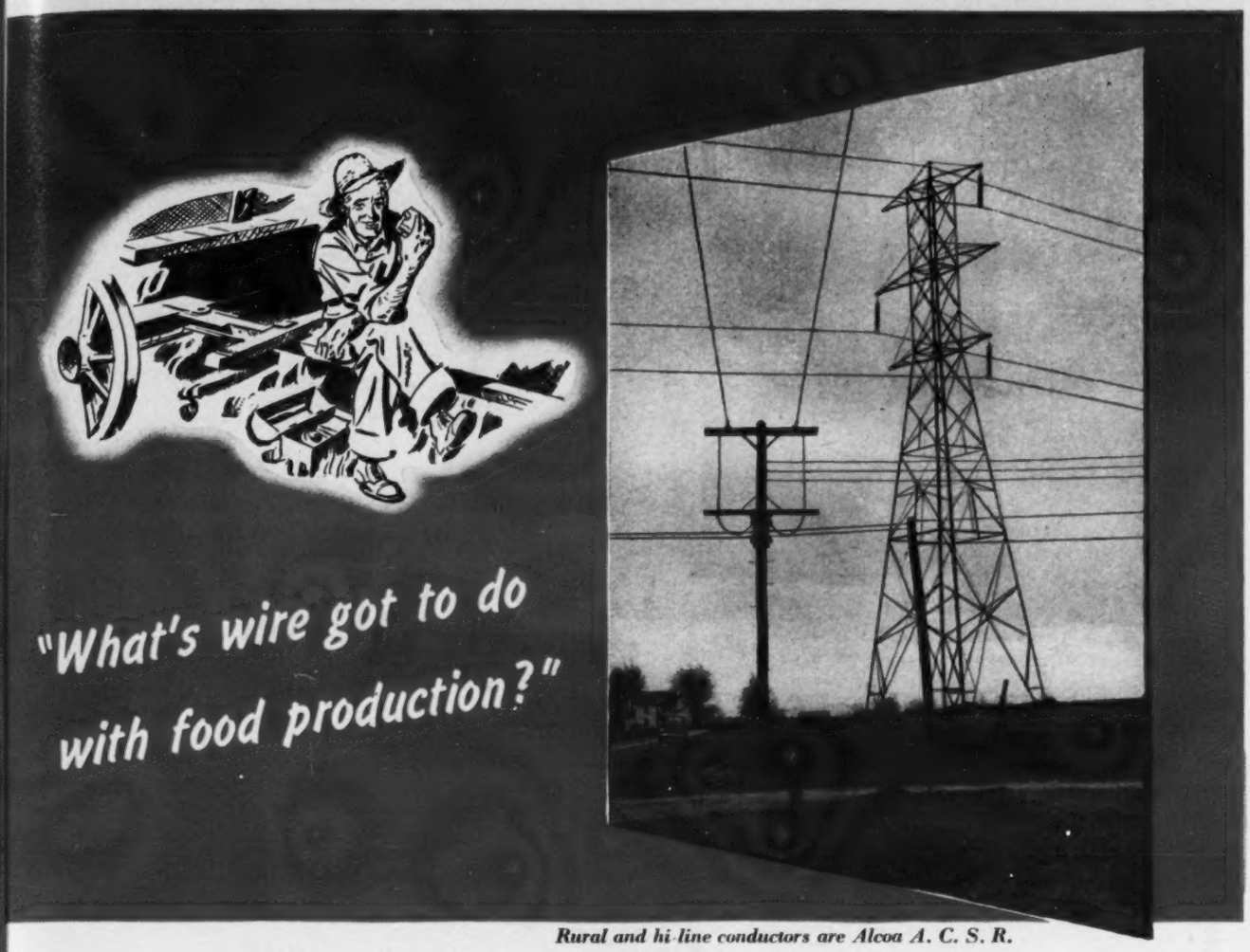
Second type of grinder has a different mounting. In this case a 4x5-in. wooden block 8 in. long is used for the standard. End housings of an automobile generator with the ball bearings left in are then bolted to the wooden block. A hole is drilled through the block for the shaft which is then fitted into the bearings and assembled as illustrated.

Bearings from burned out automobile generators may be useful in making many other pieces of farm equip

Working Model Helps to Sell Barn Drying of Hay



ON THE PRINCIPLE that to show 'em is better than to tell 'em the East Tennessee Light and Power Company built this working model to demonstrate barn curing of hay. The interested prospect can put his hand inside and feel the air emerging from the ducts over the whole floor level and thus be sure that all the hay will be subjected to drying effect. According to M. F. Rutherford, rural service engineer, the model of an electric barn drier is a most effective sales aid



Rural and hi-line conductors are Alcoa A. C. S. R.

The electricity flowing in those two lines is headed in different directions. To the city, where it drives machines that fabricate the equipment our fighting men must have. To the country, where it helps the farmer produce the foodstuffs the whole world is needing. Both are vital war production.

Recognizing that rural lines and hi-lines, alike, must be kept working at top efficiency, power conductors and fittings were long ago made available for emergency work.

If you're planning to extend existing lines, install conductors of sufficient size to deliver *all* the power that's needed. Otherwise you handicap the man who is counting on using electricity to replace workers who have gone to war. A.C.S.R. provides the desired combination of high electrical conductivity, high strength and resistance to corrosion.

Alcoa engineers will gladly assist on your line maintenance and construction problems. ALUMINUM COMPANY OF AMERICA, 2138 Gulf Building, Pittsburgh 19, Pennsylvania.

ALCOA A·C·S·R

ALUMINUM CABLE STEEL REINFORCED

ALCOA ALUMINUM

LOOK TO WESTINGHOUSE

WESTINGHOUSE

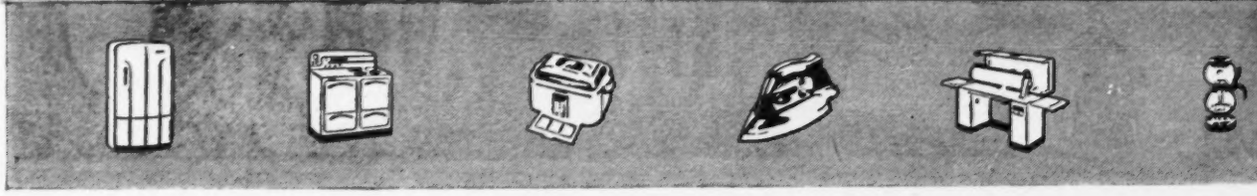
These Load-Building Leaders

HAVE AN OUTSTANDING BACKGROUND

Outstanding in . . . (1) number of years of manufacturing experience . . . (2) public acceptance . . . (3) national advertising . . . (4) utility promotion plans . . . (5) specialized sales training activities . . . (6) co-operation of field organization . . .

plus an understanding of Utility Problems

BETTER CARE LESS REPAIR



FOR LEADERSHIP

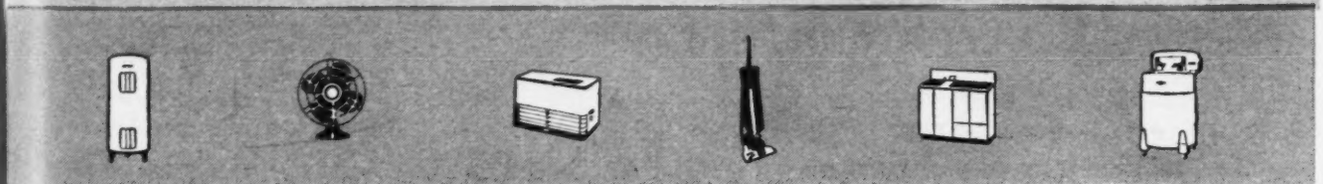
30 MILLION PRE-WAR

Westinghouse

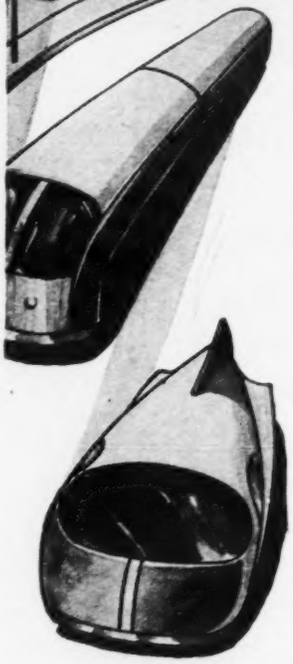
ELECTRIC HOME APPLIANCES

YOUR PROMISE OF STILL FINER ONES TO ~~COME~~ SELL

Tune in: John Charles Thomas • Sunday, 2:30 EWT., N. B. C.
"Top of the Evening" • Mon. Wed. Fri. 10:15 EWT., Blue Network



Traffic
COMING EVENTS CAST THEIR SHADOWS BEFORE THEM
Lights



Yes, the traffic panorama of the future will be different. Postwar plans already conceived foreshadow many changes and improvements.

And incandescent lighting will definitely continue to play a major role along the nation's streets and highways everywhere. For intensive research and study have proved their spectral emission to be more uniform and continuous, producing an illumination which is generally agreeable, with very little color distortion . . . all essential to greater traffic safety.

As a result of scientific advancements, SLATER progress will keep pace with the new trend toward public traffic developments. Shapes and sizes will be available to conform with the new optical systems of luminaires.

SLATER engineers, with an expert understanding of illumination, are ready to cooperate with you in your present or postwar street lighting problems, to assure a high rating in visibility at a low lighting cost.

Catalog upon request

SLATER ELECTRIC & MFG. CO.

BROOKLYN, NEW YORK

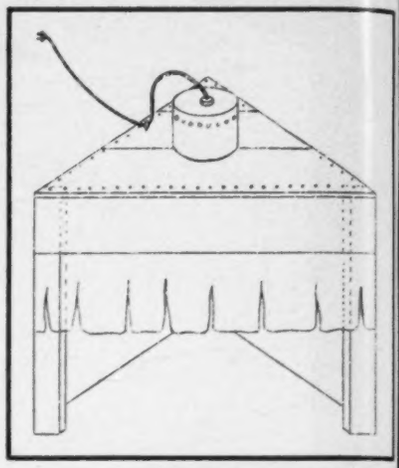
MANUFACTURERS OF STREET LIGHTING LAMPS, AND PRECISION ELECTRONIC TUBES

ment and are usually available at a small cost at automobile wrecking yards. The solid steering wheel shaft mentioned above is also good source of material for shafting.

•

Utility Issues Brooder Designs

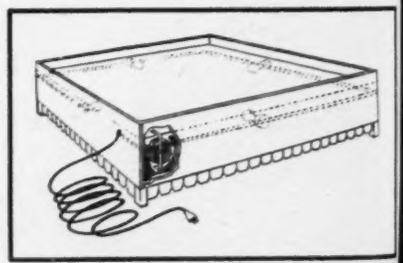
In co-operation with vocational agriculture schools and 4-H groups in the service area, rural service engineers of Public Service Co. of North-



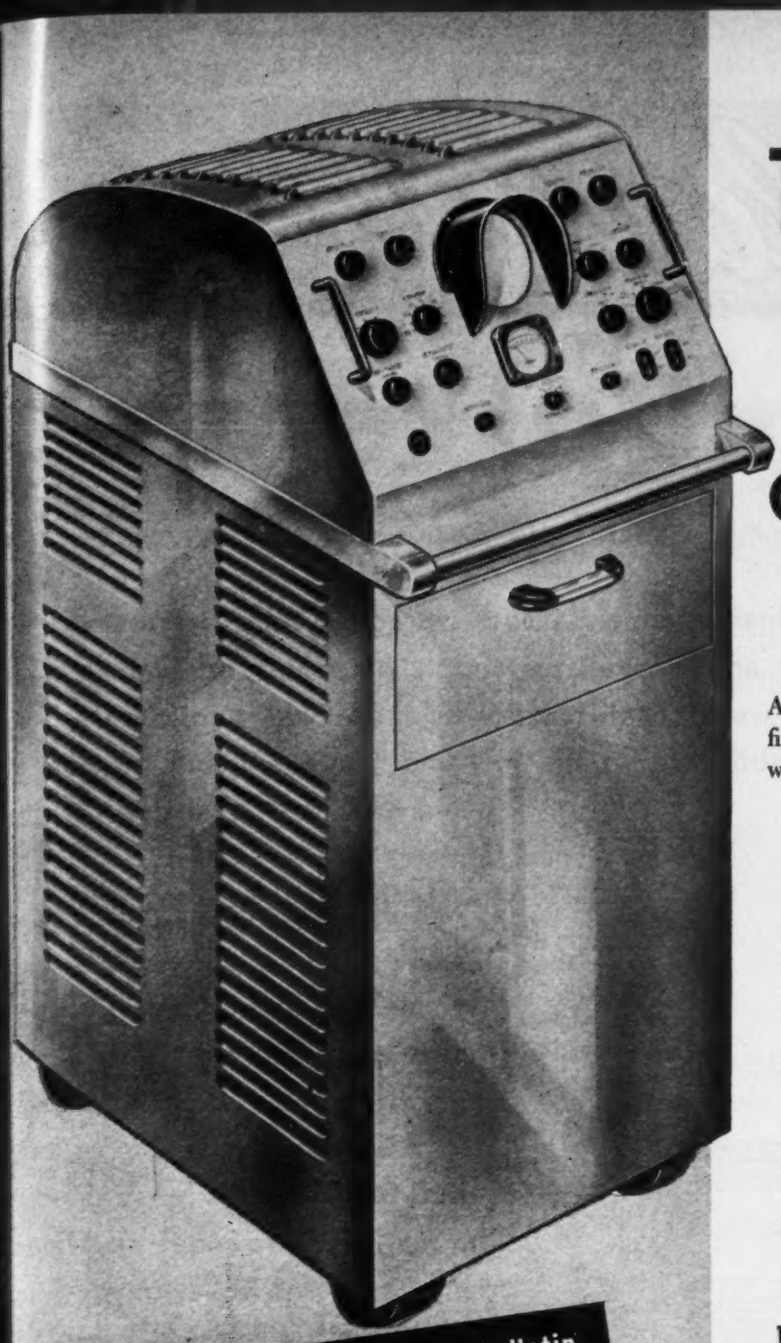
LAMB BROODER, has a right triangle in plan, is 18 x 18 x 26 in. and 18 in. high. A 100-watt lamp in a ventilated coffee-can reflector atop the brooder is the heat source. Hardware cloth a foot square should cover the hole in the brooder top. A porcelain socket is recommended for the lamp with a suitable length of extension cord

ern Illinois have drawn up and distributed a series of instruction sheets for the building of lamb, chick and pig brooders.

Designs shown in illustrations use materials readily found in the farm



CHICK BROODER, four feet square and a foot high, this design uses four 150-watt lamps, one on each wall, controlled by a water-type thermostat switch. Ceiling of the brooder is a ¼-in. plywood panel covered with ground corncob litter



The NEW RCA Type 715-A

Laboratory-type OSCILLOSCOPE

Triggered Sweep and Time-Base Marker

A "custom-built" design now available for the first time for general use—especially suited for war work—ideal for post-war problems.

10 Important Features

1. Triggered sweep—individually triggered by each signal.
2. Time-base marker; one microsecond intervals.
3. Sinusoidal horizontal spot deflection at power line frequency with adjustable phase control.
4. Extended frequency range — vertical amplifier flat to 10 megacycles.
5. High vertical deflection sensitivity (.66 volts/inch).
6. Precisely compensated attenuator for vertical amplifier.
7. Calibration meter to permit direct determination of amplitude of any voltage component in signal.
8. Low input capacity and high input resistance for vertical amplifier.
9. Complete absence of cross-coupling between horizontal and vertical deflection circuits.
10. Regulated power supply to insure steady pattern on screen independent of line voltage changes.

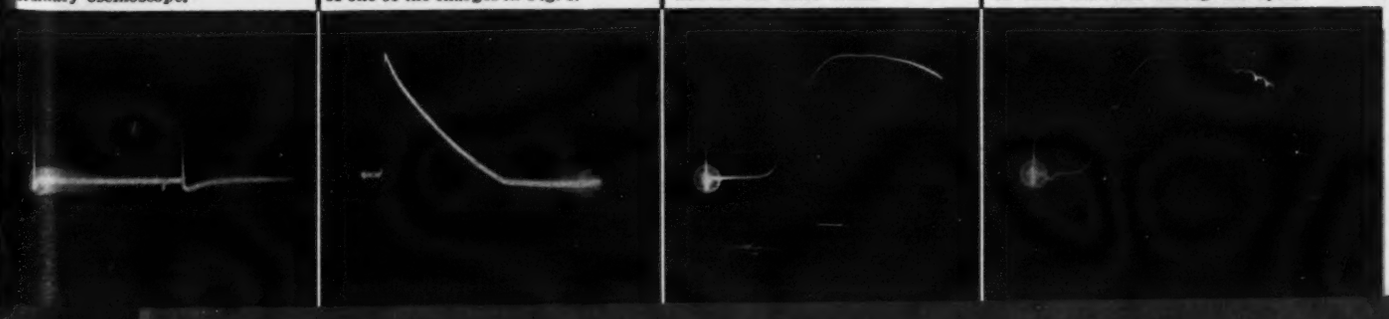
For complete details, send for bulletin

Deliveries of this instrument will be as scheduled by WPB approved Form 3243 under Scheduling Order M-293. Please address inquiries to Test and Measuring Equipment Section, RADIO CORPORATION OF AMERICA, Camden, New Jersey.

RADIO CORPORATION OF AMERICA

RCA VICTOR DIVISION • CAMDEN, N. J.

LEADS THE WAY.. *In Radio.. Television.. Tubes.. Phonographs.. Records.. Electronics*



1 Sudden condenser charge and subsequent discharge as seen on ordinary oscilloscope.

2 Externally synchronized and expanded 50 times, revealing the true form of one of the charges in Fig. 1.

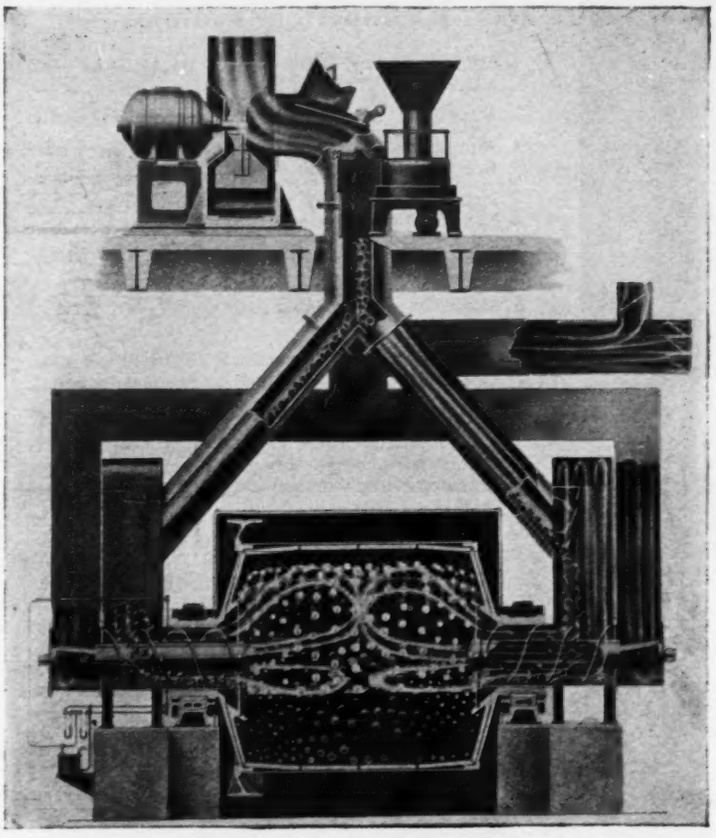
3 The same charge, expanded 1000 times, permits detailed observation of the wave front.

4 Applying a one-microsecond time-base marker allows determination of time intervals during the cycle.

Blazing THE Pulverized

Fuel Storage in Units Systems

• When pulverized fuel was first commercialized, storage systems were provided for large installations to insure an ample available supply of pulverized fuel to meet sudden load swings. Unit systems were unsatisfactory as there was considerable lag between the time of change in feed rate to the mill and the change in amount of pulverized fuel available at the burner.



Development of the Foster Wheeler unit system incorporating the ball mill (Hardinge type) makes immediately available a six to eight minute supply of pulverized fuel. This reservoir of prepared fuel is always maintained in the mill ready to meet additional demands of the boiler beyond the rate at which it is being operated. Rate of feed is governed by a controller which keeps a constant level of fuel in the mill.

Foster Wheeler is a Three-Star winner under the U.S. Navy Board of Awards for production.

FW FOSTER

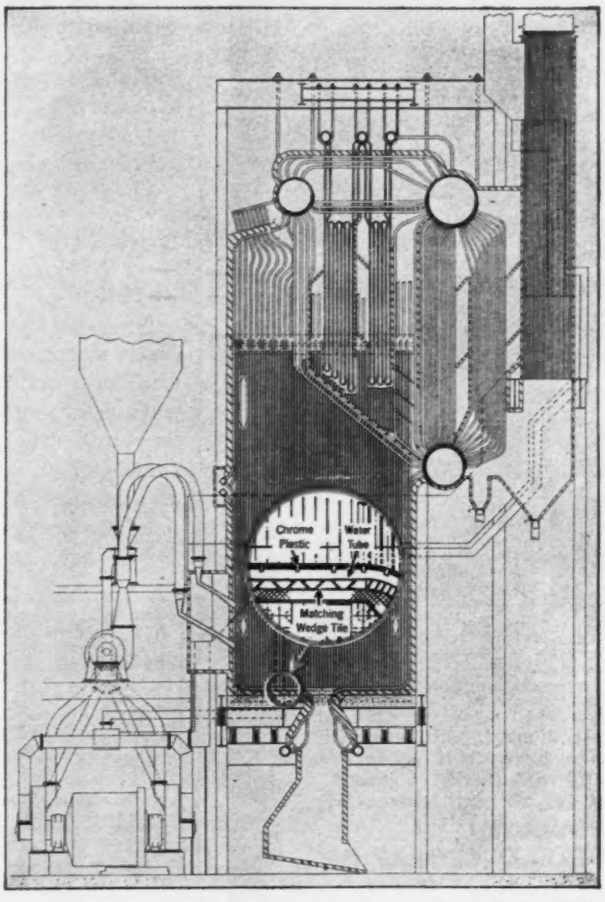
ENGINEERING TRAIL

Fuel Equipment

Flexible Floors for Slagging Furnaces

• The interlocking wedge tile construction for slagging furnace floors, originated by Foster Wheeler, has been highly successful for the past thirteen years.

The wedge tile design is used not only in continuous slag removal and intermittent slag tap furnaces, but also in both air and water cooled slagging furnace floors.



The advantages of this construction are:

1. **Expansion difficulties eliminated as horizontal expansion is transferred to vertical movement.**
2. **Continuous tightness.**
3. **Long life.**
4. **Negligible maintenance.**
5. **No outages due to furnace floors.**

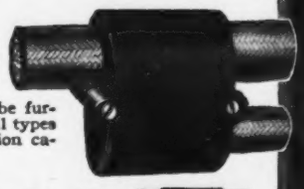
FOSTER WHEELER CORPORATION
165 BROADWAY
NEW YORK 6, N. Y.

WHEELER FW

from the MOST COMPLETE lin
of Cable Taps

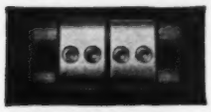
Now you can select from a really *complete* line of standard and special taps. Every one carefully designed and manufactured.

Parallel and 90° taps — and combinations — in the widest variety. For conductor sizes up to 1,000,000 CM.

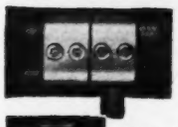


Gutter Tap with Bakelite Cover. Insulating covers can be furnished for all types of Penn-Union cable taps.

2-way Gutter Tap. Main and branch sizes 8 to 1,000,000.



Two Separate Parallel Taps to a continuous main conductor.



Combination Cable Taps; one branch parallel to main, and one at 90°.

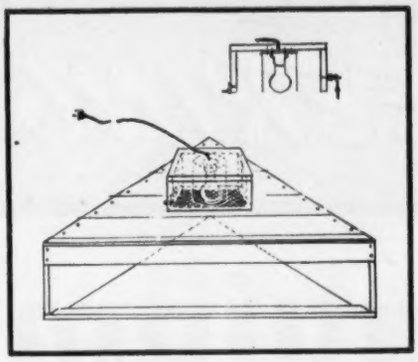
Hinged Clamp of Penn-Union Type HFM makes installation easy. Multi-slit tapered sleeve assures permanent grip on branch.

Positive Equalized Pressure on main and branch, with Penn-Union Type SM. Tightening torque is accurate measure of the clamping force.

Also the *most complete line* of Service Connectors — Terminals — and thousands of other fittings, for all requirements.

PENN-UNION ELECTRIC CORPORATION
ERIE, PA. *Sold by Leading Jobbers*

PENN-UNION
Conductor Fittings



PIG BROODER, which is a foot deep, is in the shape of a right triangle with 3½-ft. legs and a 5-ft. base. Either of two lamp sizes can be used: 100-watt for warm weather, or 200-watt for cold weather. Suggestion is that the porcelain socket be installed in a 12 x 12 x 8-in. housing hinged to the top center of the brooder for convenience in changing lamps. Hardware cloth should be used to cover the hole in the brooder top. A coffee can may be used as a reflector around the lamp. Arrangement for lamp mounting is shown at top of illustration

workshop and can be built by the average farm youngster with the assistance of local vo-ag instructors or manual training teachers.

•

New Post Card Bill Brings Cost Savings

New simplified post card bills, recently adopted by the Detroit Edison Co., represent a departure in many ways from the company's old envelope-enclosed bill form. Several advantages both to the customer and the company accrue from the changes that have been made.

The new post card bill will be smaller. As a consequence it will be convenient to carry in the pocket or bill fold. Heavier paper stock to be used lessens the chance for mutilation.

Punched holes in the stub portion of the new bill permit mechanical sorting of a customer's payment by street location and account.

In its post card form cost of preparing, the bill will be considerably reduced. Savings will be realized in manpower, paper, envelope stuffing, printing and sorting.

Space formerly provided for customers to compute their bill has been eliminated. However, the reduction in size of the new bill is not expected to deprive the customers of essential information. Explanation of company rates is shown on the face of the bill for the convenience of the customer.

Due dates are mechanically printed along with other billing information when the bill is figured. This eliminates waste which formerly resulted from making up more bill forms for a particular due date than were needed.

Only the account number will be shown on the coupon. The account number is all that is necessary to apply a customer's payment to the proper account. This may result in inconvenience to employees handling coupons but any disadvantage will be offset by economics realized through the use of the post card form.

Postal zone numbers will be included printed on all new bills to conform to the Government's request to save time and manpower. The bill will be white, printed in blue ink. A sample bill is shown, herewith.

THE DETROIT EDISON COMPANY—RESIDENCE ELECTRIC SERVICE
TWO MONTHS' BILL unless dates below show otherwise

For Service From JAN 21 to MAR 22 Due APR 15 1944

RATE—First ten units (kilowatthours) per month @ 8¢ each. Next forty units per month @ 4¢ each, all additional units @ 2½¢ each. Minimum bill 50¢ per month. Discount for prompt payment 10%.
If bill covers two months' service, the number of units at 8¢ and 4¢ is doubled.

METER READING	TOTAL UNITS USED	AMOUNT
6602	200	7.52
PRECEDING METER READING	UNITS FIRST STEP	LESS 10% DISCOUNT IF PAID BY DUE DATE
6402	20	6.77

Symbol A before reading indicates meter not read. Billed on your normal use.

3% Michigan Sales Tax included in above amounts
Unpaid balances, if any, are not included in this bill.

Due Date APR 15 1944

Route	Ledger	Folio
12	107	4560

$ 6.77

Detach Here

Please return this stub when paying by mail address shown on reverse side.

PUNCHED STUB of Detroit's new simplified post card bill permits mechanical sorting by customer's account and street location. Name and address are on reverse side

"We Make All Kinds"

. . . says *Rōmey

*Copr. 1944 RCC

"Here at Rome Cable," says Romey, "we make many kinds of copper wire and cable, from the most rugged kind of heavy-duty cable all the way down to bare wire so fine you can hardly see it.

"Here's some of the types of wire and cables we make:

HOT ROLLED COPPER RODS

BARE and TINNED COPPER WIRE
(in rounds, flats and squares)

BARE and TINNED STRAND

WEATHERPROOF WIRE and CABLE
- U. R. C.
- Slowburning

MAGNET WIRE
- Cotton
- Asbestos
- Paper
- Enamel
- Glass

FLEXIBLE CORDS
- Radio Wires

RUBBER COVERED WIRES and CABLES
- Solid or Stranded
- Single or Multiple Conductors
- Building Wire
- Power Cables
- Heavy Duty
- Arc Welding
- Mining Machine
- Locomotive Gathering
- Service Entrance
- Lead Covered

SYNTHINOL BUILDING WIRE

SYNTHINOL MACHINE TOOL and CONTROL WIRE
(Thermoplastic Synthetic Insulated)

FIXTURE WIRE

"Send us your inquiries."

FROM BAR TO FINISHED WIRE

OME CABLE
ORPORATION
OME · NEW YORK

NEW EQUIPMENT

Type "247" oscillograph; 5-in. diameter screen; dimensions, 14 in. wide, 19 in. high, 26 in. deep; weight, 130 lb. **Allen B. Dumont Laboratories, Inc.**, Passaic, N. J.

Oscillograph

For investigation of transient as well as recurrent phenomena over a wide frequency range, new oscillograph utilizes type 5CP1 cathode-ray tube with intensifier electrode, operated at an over-all accelerating potential of 3,000 volts. Sweep frequency range has been extended down to 0.5 cycle per second, providing a wider range of sweep operation for observation of low-frequency functions. The time-base provides recurrent, single or repetitive sweep operation.

•

Portable heating and dipping tank; heater for 110 or 220 volts; automatic temperature control. **Heil Engineering Co.**, 12901 Elmwood Ave., Cleveland, Ohio.

Dipping Tank

Designed for a wide variety of uses, tank is divided into three compartments—No. 1 is furnished with an insulating wall and with a heating unit for hot alkaline degreasing compounds, No. 2 is for cold rinsing, and No. 3 is lined with Plast-O-Ply suitable for pickling acids, electroplating chemicals, acid cleaners and corrosive fluxing salts. All compartments have bottom and overflow control. Cover serves as a shelf.

"All-Out" fire extinguisher; weight, 37 lb. **National Powder Extinguisher Corp.**, 50 Rockefeller Plaza, New York, N. Y.

Fire Extinguisher

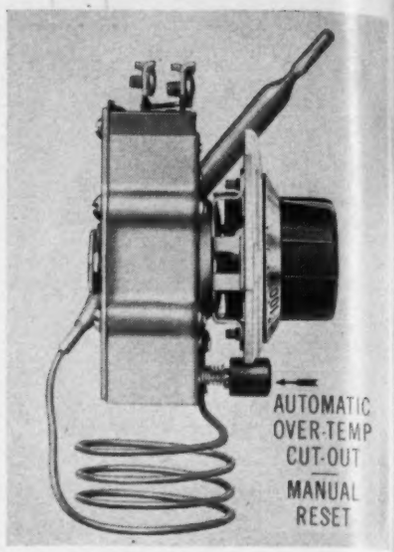
Designed for extinguishing fires from flammable liquids and electrical origin, new device ejects a stream of dry chemical which, when activated by heat, forms a dense, fire-smoothering cloud over an area up to 18 ft., it is stated. Insulating qualities of the cloud help guard against re-flash and create a heat-deflecting screen between the operator and flame, permitting close range attack. The chemical, a non-conductor of electricity, is said to be harmless.

•

Lamp-less voltage tester; 110, 220, 550 v., a.c.; 125, 600 v., d.c. **Square D Co.**, 6060 Rivard St., Detroit 11, Mich.

Voltage Tester

Housed in a cylindrical fiber case, pocket-size voltage tester has been designed to give voltage identification and to distinguish between a.c. and d.c. supply. It tests without lamps and has 4-in. fiber grips on leads to give complete insulation. Leads are 24-in. flexible wire with double thickness, rubber insulation vulcanized to the wire. Sharp spear points on the ends of the leads permit piercing of wire insulation for testing without damaging it.



"H-1" electric temperature control. **Robertshaw Thermostat Co.**, 30 Church St., New York 7, N. Y.

Temperature Control

Control device consists of standard Model D1 double-pole, single-throw electric temperature control, equipped with an auxiliary single-pole, single-throw switch to automatically cut off all current as soon as operating temperature is exceeded by 30 deg. F. in liquid or 50 deg. F. in air due to negligence or fusing of thermostatically operated contacts. The circuit is made through the contacts of the limiting device by pushing in on the re-set manually operated button.

•

Welder Cooling Unit

Air-cooled self-contained refrigeration unit; 1.5 hp. motor-driven compressor, starts unloaded. Airtemp Division, **Chrysler Corporation**, Detroit, Mich.

Designed for cooling resistance spot welders, the packaged unit has a counter-flow liquid cooler mounted in the base and a hermetically sealed radial compressor. Insulated storage tank is equipped with ¾-hp. pump with nominal 6-gpm. capacity. The unit is equipped with higher pressure cutout, a remote bulb thermostat for temperatures from −20 to +20 deg. F.

•

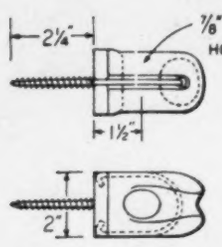
Ohmmeter

Model "L-2" megohm meter; range 1 to 500,000 megohms; 110-volts, 60 cycles, a.c. **Industrial Instruments, Inc.**, 156 Culver Ave., Jersey City, N. J.

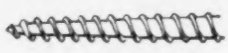
Essentially a direct-reading ohmmeter, new device incorporates a vacuum-tube voltmeter, to cover relatively high resistance values. The self-contained instrument is designed for checking leakage resistance of cables and insulating materials, locating defective insulation in equipment and measuring carbon resistors. Arrangements are provided for the rapid charging of condensers under test. Stability is assured by balanced tube circuit and voltage regulator in the internal power supply, it is claimed.

BUYING ELECTRICAL EQUIPMENT?—McGraw-Hill's *Electrical Buyers Reference* is a convenient place to look first for manufacturers' product data, names and addresses.

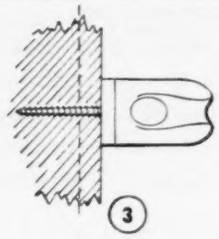
HUBBARD 4-11-44 WIREHOLDERS



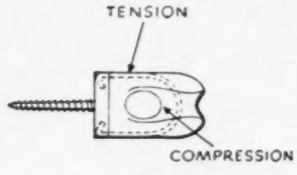
1 Two Views of Hubbard 4-11-44 at 90° Turn



2 Special Screw



3 Full Thread



4 Cut-away Section

1 Two diagrams of the Hubbard 4-11-44 Wireholder showing its sturdy construction. Tests on these wireholders, dead-end pull, have far surpassed recommended ratings on standard house service conductors. This is true of the wireholder itself. To insure maximum strength of an installation, a solid mounting is necessary. Attachment to sheeting so thin as to engage only a small portion of the screw (as shown by dotted line in Fig. 3) naturally reduces the holding power of the installation as a whole, no matter what the strength of the wireholder may be. This should be avoided.

2 Not an ordinary wood screw, but specially designed with a sharp point and a small root diameter near the point to allow easy starting. A light pressure is sufficient to start the screw in wood.

3 Full threaded screw, so that unavoidable installations on thin material are not caused to be excessively weak by lack of threads near the base. (See dotted line showing how installation on thin wood will not develop full strength of wireholder owing to reduced holding area of screw threads.)

4 A "tried and true" Hubbard Wireholder principle of thirty years success. Metal parts in tension — Porcelain parts in compression under load.

HUBBARD AND COMPANY

Pittsburgh
Chicago

Oakland
California

ALL ROADS LEAD TO HARPER

When you need fastenings that (1) resist rust and corrosion . . . (2) are non-magnetic . . . (3) are practically non-sparking . . . (4) are usable again and again . . . your road leads to Harper's.

The Harper organization is known as "Headquarters for Non-Ferrous and Stainless Fastenings" because it specializes on these products . . . makes nothing of common steel. Harper stocks 4280 different items . . . operates hundreds of modern machines especially planned for the manufacture of fastenings . . . maintains a large staff of field service engineers. New, colorful 1944 catalog and reference book will be ready soon.

BRASS
BRONZE
COPPER
EVERDUR
MONEL
STAINLESS

THE H. M. HARPER COMPANY
2611 Fletcher Street, Chicago 18, Illinois

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EVERLASTING FASTENINGS

TECHNICAL LITERATURE

COAL—"The Hydrogenation of Coal at High Temperatures" is the first report of an investigation without the use of vehicles or catalysts in the temperature range from 750 to 1,060 deg. F. and at pressures up to 4,500 lb. per sq. in. Evidence is given to show that the volatile matter distilled from the coal is ultimately reduced to methane by a combination of cracking and hydrogenation. Copy of the report "Research Series No. 90" may be obtained from Engineering Experiment Station, Purdue University, Lafayette, Ind.

VIBRATION—A discussion of vibration, torsional, longitudinal, flexual, and radial whirling, and the need of calculating them is given in Booklet No. 4, "Problems In Vibrations Design," available from the Falk Corporation, Milwaukee, Wis.

STANDARDS—"A.S.T.M. Standards on Rubber Products," 1944 edition, 436 pages. Price $2. American Society for Testing Materials, 260 South Broad St., Philadelphia, Pa. It gives in their latest form all of A.S.T.M. specifications and test methods covering rubber and synthetic rubber products. War Emergency Provisions and Specifications are furnished with the book.

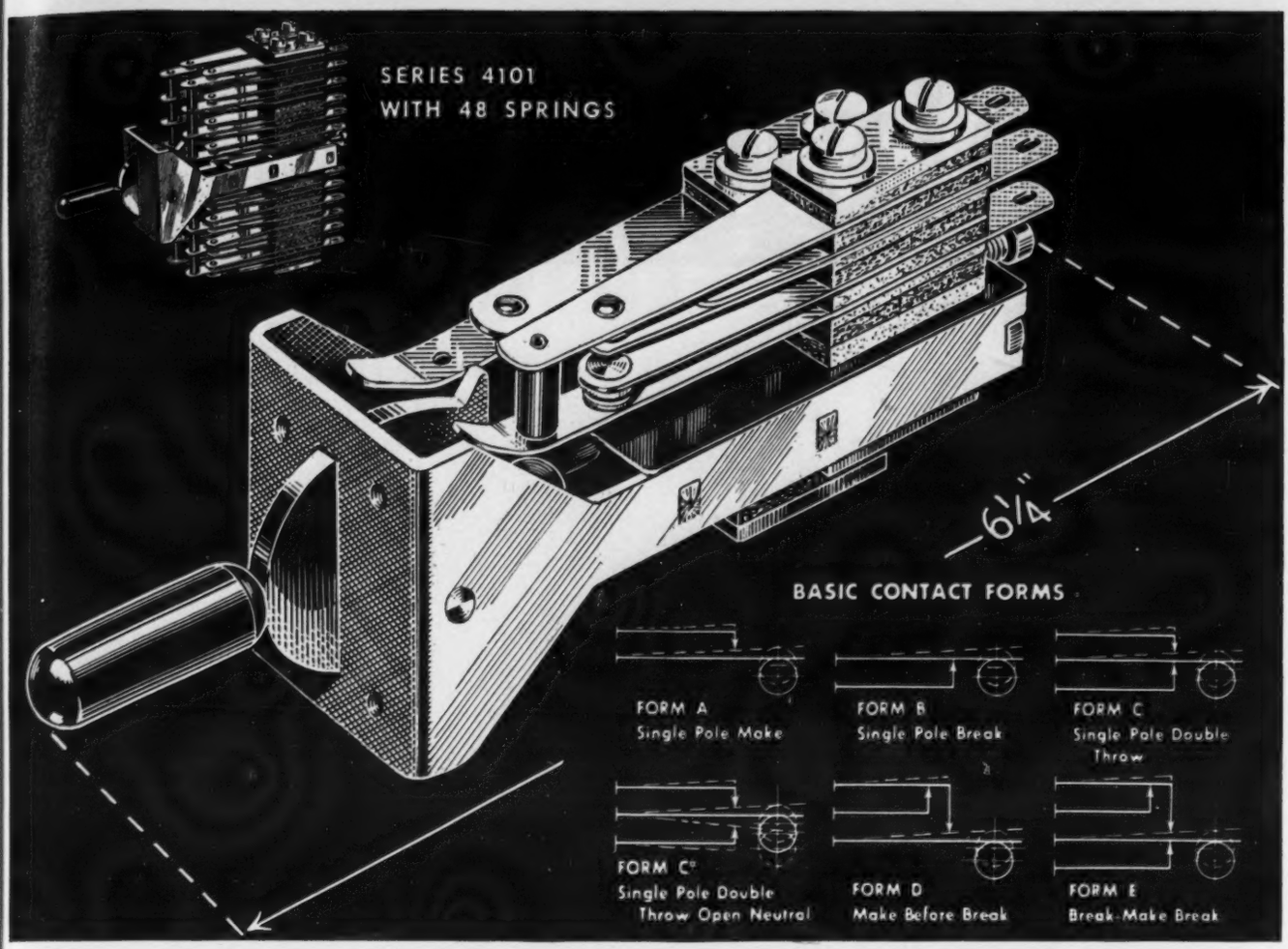
REPORT—"Interim Report of the American Research Committee on Grounding," January 1944, 24 pages. Price 10 cents. Edison Electric Institute, 420 Lexington Ave., New York 17, N. Y. It covers field cases and laboratory work—some of the subjects are protective grounding, incidental contacts, current on water pipes, gas pipes and drainage pipe, impairment of quality of water, corrosion of pipes and tanks, and electric shock and sparking.

BATTERY CHARGING—A booklet on charging equipment contains a detailed description of the two-rate and the modified constant potential systems of charging with numerous diagrams, graphs and tables. Bulletin 207, "Charging Equipment for Exide Batteries, Motive Power Service," may be obtained from Electric Storage Battery Co., 19th St. and Allegheny Ave., Philadelphia 32, Pa.

BRAZING—Bulletin No. 14, "How to Repair Broken Cutting Tools With Easy-Flo," contains instructional copy, basic principles, and examples of the actual application of the brazing method to a variety of tools. It may be obtained from Handy & Harman, 82 Fulton St., New York 7, N. Y.

"STEP UP, SPEED UP, YOUR FOOD PRODUCTION WITH RUNNING WATER" is the title of a booklet issued by the Electric Water Systems Council for distribution among farmers. In various sections of the booklet farmers are urged to put the reserve capacities of their water systems to work, to plan for "future home happiness with running water," and reminded of the importance of keeping water systems in good repair. Copies of the booklet in quantity lots can be obtained from manufacturers of electric farm pumps and water systems participating in the Council's program.

FIRE EXTINGUISHERS—A basic maintenance system, classification of various types of fires, placement of extinguishers, importance of actual demonstrations in fire-fighting technique, are some of the subjects covered in a 12-page manual, "Inspection and Maintenance of First Aid Fire Extinguishers," issued by Walter Kidde & Co., Inc., 140 Cedar St., New York 6, N. Y.



A Big, Husky Lever Switch with Almost Unlimited Circuit Arrangements

Once locked in place, all the jar and vibration in the world won't change the position of the Mossman No. 4101 Heavy Duty Lever Switch. This constant adjustment is made certain by the way we build it. The chassis is a heavy brass frame, rigidly braced. This supports a chromium plated latch plate and spring-actuated piston, in which a roller is mounted clevis fashion.

Utility engineers find the Mossman No. 4101 Heavy Duty Lever Switch permits a most versatile control set-up . . . almost unlimited circuit arrangements. This switch is furnished with as many as 48 springs . . . 12 springs per pile-up, 24 springs per position. Special pile-up arrangements are available for higher voltages and creepage ratings. Any combination of the six basic contact forms shown here is available so that this switch can most exactly meet your needs.

Utility applications for which the Mossman No. 4101 Heavy Duty Lever Switch has been found valuable include:

- Indication in remote control or telemetering circuits.
- Supervisory control circuits in load dispatching.
- Communication control circuits in utility and industrial plants.
- Testing and calibration in meter departments and for tube testing.

Standard heavy duty contacts are of 3/16" fine silver rated at 10 amperes, 110 volts a.c., non-inductive. Extra heavy duty contacts are of 5/16" silver alloy rated at 20 amperes, 110 volts a.c., non-inductive. Breakdown rating of springs to ground is 2000 volts a.c.

Send for our catalog which pictures and describes the Mossman No. 4101 Heavy Duty Lever Switch and the full line of Mossman precision electrical components, including many types of heavy duty, multiple circuit lever switches, turn switches, push switches, plug jacks and special switching components. We will be glad to send you as many copies as your engineers require.

DONALD P. MOSSMAN, Inc., 6133 Northwest Highway, Chicago (31), Illinois

MOSSMAN

Electrical Components

NEWS ABOUT PEOPLE

Niagara System Makes Executive Appointments

Rob R. Macleod, executive vice-president of the Niagara Falls Power Co., has been elected executive vice-president of the Buffalo Niagara & Eastern Power Corp. Mr. Macleod will move his offices to Buffalo to assume the newly created position under Col. William Kelly, president of the corporation.

Other staff changes in subsidiary companies of the Buffalo Niagara & Eastern system have been announced.

Wilfred C. Stephens, vice-president of Niagara, Lockport & Ontario Power Co., will move from Buffalo to Niagara Falls to become vice-president of the Niagara Falls Power Co. He will relinquish his present offices in the Niagara, Lockport & Ontario Power Co. and the Lockport & Newfane Power & Water Supply Co., but will also be made a vice-president of the Buffalo Niagara Electric Corp., which serves the city of Niagara Falls.

Succeeding Mr. Stephens will be Roy S. Allison, present manager of the Cattaraugus district of Niagara, Lockport & Ontario Power Co. As vice-president of Niagara, Lockport & Ontario Power Co. and the Lockport & Newfane Power & Water Supply Co., Mr. Allison will be in charge of the various districts of these companies.

R. R. Macleod

W. C. Stephens

R. S. Allison

In Niagara Falls, Leslie L. Ross, now a vice-president of the Niagara Falls Power Co., will, in addition, become president of the Niagara Junction Railway Co., succeeding Mr. Macleod who will resign the presidency of the Railway Company upon going to Buffalo.

•

▶ JOSEPH M. SMITH has been appointed to the newly-created position of technical director of the Fluorescent Lighting Association. Mr. Smith has been engaged in the development of cold-cathode fluorescent lamps and fixtures and their installation.

Appointments Announced by Northern States

B. W. Cowperthwait has retired as manager of the Faribault (Minn.) division of the Northern States Power Co. He has been succeeded by Stuart V. Willson, now manager of the southwestern division of the company with headqaurters at Montevideo. Mr. Cowperthwait has been associated with utility companies at Faribault for 43 years, 34 of which have been with the Northern States Power Co. For a year he will remain in an advisory capacity with the company.

C. F. Blackman, assistant sales manager of the St. Paul division, has been appointed manager of the southwestern division to succeed Mr. Willson. Mr. Blackman was first employed by Northern States in 1923, in the Minneapolis office, transferring to St. Paul in 1929.

Leonard Kolstad of the company's Eau Claire distribution department, has been appointed electric distribution superintendent for the Chippewa Falls district.

John A. Gregor, assistant chief engineer at the steam plant at Galena, has resigned after completing 35 years of service with the company. Carl J. Peterson, supervisor of the hydro plants of the Stillwater division, has also retired, after 41 years of service.

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▶ WALTER D. SMITH of Tulsa, Okla., has been appointed commercial vice-president of the Worthington Pump & Machinery Corp. A graduate of Carnegie Institute of Technology, Mr. Smith has been connected with the Worthington organization since 1923, except for a period of three years, 1933-36, when he was vice-president and general manager of the American Natural Gas Co. of Shamrock, Tex. For the past four years, Mr. Smith has been manager of Worthington's Tulsa district office as well as southwestern manager of the engine sales division. In his new capacity, Mr. Smith will supervise the corporation's business in the Southwest.

▶ WILLARD V. MERRIHUE has been named manager of the advertising and sales promotion divisions of the apparatus department of the General Electric Co. Simultaneously he was named a member of the apparatus sales committee of the company. He was previously assistant to the manager of the apparatus publicity divisions, Robert S. Peare, whose election as vice-president in charge of the company's advertising, broadcasting and general publicity activities has recently been announced (ELECTRICAL WORLD, May 6, page 16). Mr. Merrihue started work in the edi-

RYERSON STEEL RACES ACROSS COUNTRY

10 Tons of Sheets Delivered 700 Miles in 30 Hours 20 Minutes

It is 4:10 P.M.—a truck with ten tons of sheet steel pulls away from the Ryerson Chicago plant. In a Western war factory 700 miles away, important production for Army invasion equipment is waiting.

Flying the ODT "Emergency Flags" with special permission to travel at 60 miles an hour, the shipment arrives the next day at 11:30 P.M.—just 30 hours and 20 minutes after the order was dispatched.

Two significant facts: The sheets so urgently needed were in Ryerson stock for immediate shipment. And Ryerson facilities and service measured up to the emergency.

Unusual? No! This order is only one of many Ryerson emergency shipments that are preventing production shut-downs in these critical times. Every day, Ryerson skill and experience are expediting deliveries of vital steel.

Next time you need steel in a hurry, whether it is sheets, plates, bars or beams—we urge you to call the nearest of the ten Ryerson Steel-Service plants. Whatever you require, you'll get prompt, effective cooperation.

Joseph T. Ryerson & Son, Inc., Steel-Service plants at: Chicago, Milwaukee, St. Louis, Cincinnati, Detroit, Cleveland, Buffalo, Boston, Philadelphia, Jersey City.

RYERSON STEEL-SERVICE

PROTECT ALL CIRCUITS WITH G-E FUSES

WHETHER you need enclosed cartridge fuses with 600 ampere capacity or 15 ampere plug fuses, you'll find them all in the G-E line. Many kinds and sizes are available.

The G-E line includes:

1. *Non-renewable enclosed fuses*, either indicating or non-indicating with 1 amp. to 600 amp. capacity, 250 or 600 volts.
2. *Renewable enclosed fuses* with 3 amp. to 600 amp. capacity, 250 or 600 volts.
3. *Silvend fuses* with silver-plated contacts with 3 amp. to 600 amp. capacity, 250 or 600 volts.
4. *Pyrex* plug fuses* with 3 amp to 30 amp. capacity, 125 volts.

All of these fuses are made of the best materials. They are thoroughly tested and accurately rated. The Silvend fuses are designed for use with apparatus having silver-plated fuse contacts. Heating due to oxidation does not occur with this combination. The Pyrex fuses have magnifying windows for easy reading.

For further information, see the nearest G-E Merchandise Distributor or write to Section D541-9, Appliance and Merchandise Department, General Electric Company, Bridgeport, Conn.

*Reg. U.S. Pat. Off.

Hear the General Electric radio programs: "The G-E All Girl Orchestra" Sunday 10 P.M., EWT, NBC. "The World Today" news every weekday 6:45 P.M., EWT, CBS.

BUY WAR BONDS

GENERAL ELECTRIC

torial section of the company's publicity department in Schenectady in 1925 immediately after his graduation from the University of Pennsylvania. In 1930 he was named assistant manager of the industrial advertising section of the department, and three years later was appointed division manager of central station advertising. In 1939 he became assistant to the manager of the publicity department in charge of the apparatus division, the position he held until his new appointment. In 1938 Mr. Merrihue received a Charles A. Coffin Foundation Award of the company for "initiative, ingenuity and perseverance in devising a new and unusual sales plan."

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H. R. Searing Assumes New Executive Duties

Hudson R. Searing, who was recently elected executive vice-president of Consolidated Edison Co. of New York, Inc.,

(ELECTRICAL WORLD, May 20, page 10) was first employed by the New York Edison Co. in 1909. He is a native New Yorker and a graduate of Cooper Union. Following service in World War I, he returned to the Edison Co. in 1919 and advancing through the engineering departments of the company, in 1939 he became engineer of operation. He was promoted to the position of vice-president in charge of the electric and gas production and operation department of the company in 1940.

Mr. Searing is a director of Brooklyn Edison Co. and the Yonkers Electric Light & Power Co., units in the Consolidated Edison System.

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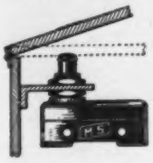
► DR. STUART D. DOUGLAS, head of plastics research, Carbide and Carbon Chemicals Corp., South Charleston, W. Va., has been made the recipient of

Only MICRO SWITCH Fills All These Requirements

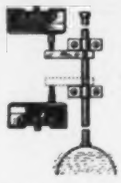
Thumb Size • Weighs Less Than One Ounce • Millions of Operations • Operating Force as Little as One Ounce • Operating Movement as Little as .0003" • Good Electrical Capacity • 1200 VA-AC

HUNDREDS OF UTILITY APPLICATIONS FOR MICRO SWITCH

Illustrated here are a few of the applications for which Micro Switch has proven accurate and dependable. Micro Switches are backed by a laboratory and engineering staff with years of experience in precision switching. We invite you to submit special switching problems to us.



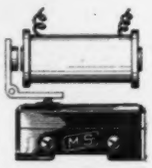
Cabinet Door Switch. For safety, alarm, or interlock on H.T. cabinets, transmitter or switch compartments. When the door is closed the Micro Switch is actuated, closing the circuit.



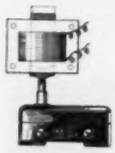
Level Gauge. Rod on float actuated shaft carries arm which operates spring plunger switches at either "high" or "low" position. Signal would remain on until switches are manually reset.

Draft Indicator. A remote damper position indicator can be operated by a cam on a damper shaft and three switches to make contact at "open", "half" and "closed" positions.

Bellows Thermostat. Fluctuations in temperature change the length of the bellows to operate the Micro Switch.



Relay Control. Relay operates Micro Switch to control other circuits.



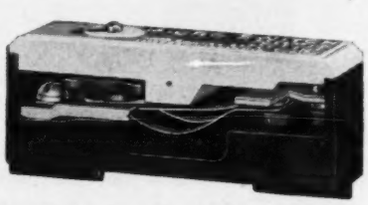
Solenoid Control. Solenoid, when pulled in, operates a spring plunger Micro Switch to control other circuits.

Utilities are rapidly finding more and more uses for the Micro Switch because this small, snap-acting precision switch more fully than any other fills the needs for a switch to control substantial amounts of power and to operate in small space.

The basic Micro Switch in the Bakelite case is built with various contact separations and in several degrees of sensitivity, some switches requiring as little as 2/1000 ounce-inches of energy for operation. Basic switches are combined with a wide range of easy-to-use housings that provide conduit connections, mechanical protection, and several types of actuators. These housings also provide devices to absorb actuating motion beyond the small movement required to operate the Micro Switch. There are over 2700 variations of housings, actuators and electrical characteristics built around the basic Micro Switch.

Micro Switch is Underwriters' listed and rated at 1200 V.A. at 125 to 460 volts ac. Capacity on dc loads depends on load characteristics.

Micro Switch Handbook-Catalog No. 60 will give you complete details as to electrical characteristics, construction, applications and dimensions. Send for it today.



Cut open view of Micro Switch which shows clearly the three bladed beryllium copper spring which is the patented heart of the Micro Switch.

Micro Switch Corporation, Freeport, Ill.
Branches: 43 E. Ohio St., Chicago (11) • 4900 Euclid Ave., Cleveland (3) • 11 Park Pl., New York City (7) • 1709 W. 8th St., Los Angeles (14)
Sales & Engineering Offices: Boston • Hartford Portland, Ore. • Dallas, Tex.

Let's All Back the Attack—Buy EXTRA War Bonds

The trademark MICRO SWITCH is our property and identifies switches made by Micro Switch Corporation

© 1944

MICRO MS SWITCH

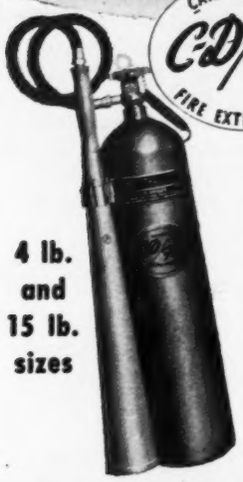
Made Only By Micro Switch Corporation . . . Freeport, Illinois, U. S. A.

THIS WAS A FAMOUS FIRE..

Free copy of this Currier & Ives print, suitable for framing, on request. Limited supply. See coupon below.

The Great Fire at Chicago commenced on Sunday evening, October 8, 1871, and swept unchecked for two days. It consumed over 5 sq. miles of the business portion of the city and destroyed public buildings, hotels, newspaper offices, railroad depots and tenement districts. Five hundred lives were lost and damage was estimated at $200,000,000! . . . Watch future issues of this magazine for old prints of other famous fires.

..AND HERE'S A FAMOUS FIRE FIGHTER



CARBON DIOXIDE C-D/Fog FIRE EXTINGUISHER

4 lb. and 15 lb. sizes

C-D/Fog is sudden death to fire. One quick application seals out air, snuffs flame. It's swift, safe, sure. C-D/Fog promptly extinguishes oil, gasoline, electrical and chemical fires — operates with full effectiveness in hot or sub-zero weather. It's harmless and odorless. C-D/Fog belongs to a famous family of fire fighters, among them Fire Guard, Alaskan, Floafome. It is quality mass produced for prompt delivery to essential users.

If it's GENERAL DETROIT it's Better

THE GENERAL DETROIT CORP.

Former name the General Fire Truck Corp.

NEW YORK DETROIT CHICAGO

Distributors in all principal cities

West Coast Affiliate: The General Pacific Corp., Seattle, Los Angeles, San Francisco.

HANG THIS ON YOUR WALL

THE GENERAL DETROIT CORP.
2200 East Jefferson Ave., Detroit 7, Michigan

Please rush my free copy of "The Great Fire At Chicago." Include details on C-D/Fog.

Name _____

Title _____

Attach this convenient coupon to your letterhead and mail. (416)

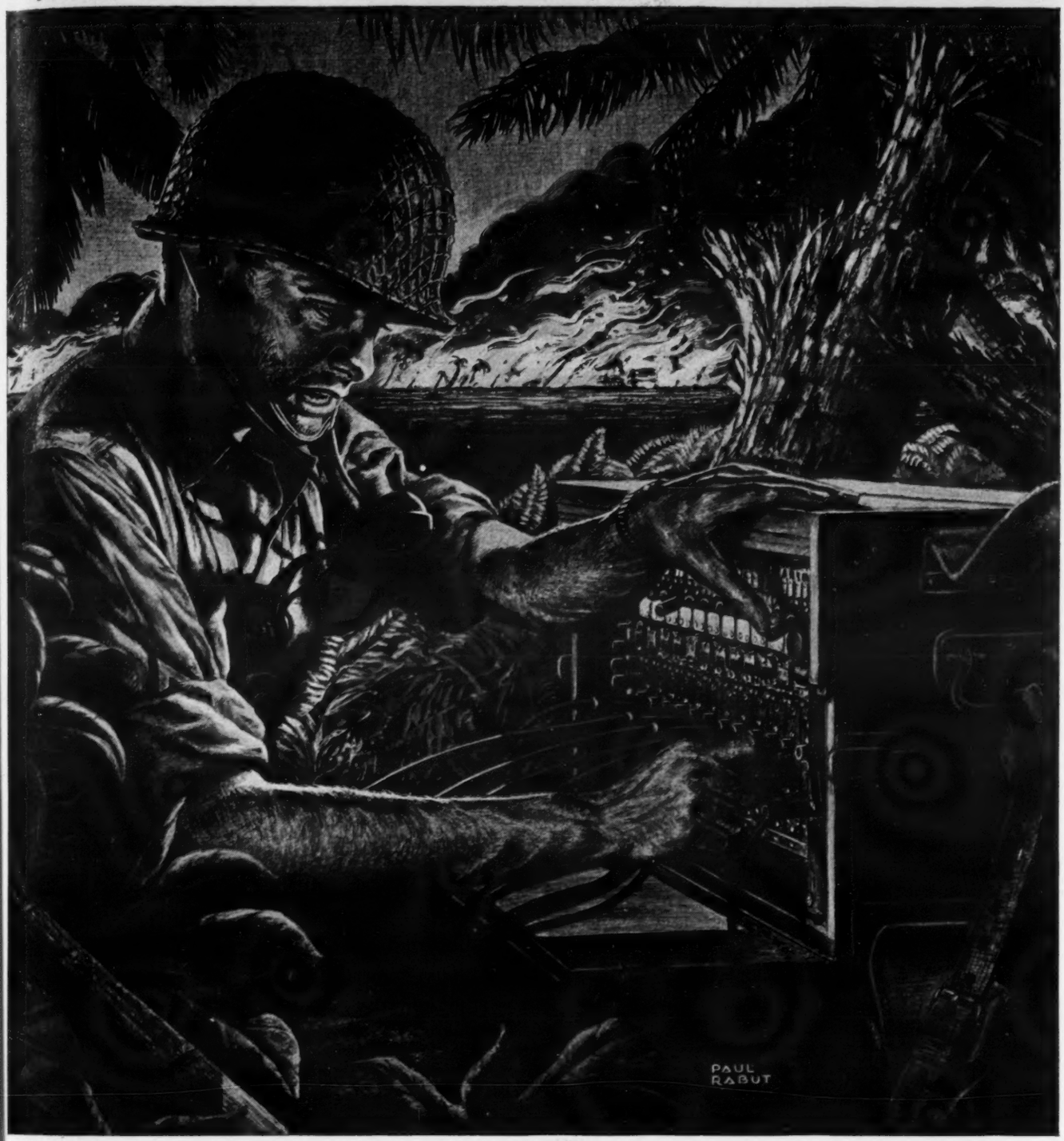
the John Wesley Hyatt gold medal for his work in polymerization of vinyl resins. The award, which is sponsored annually by Hercules Powder Co., and carries with it a cash gift of $1,000, was made at a luncheon during the annual conference of the Society of the Plastics Industry held recently in Chicago. The accumulated results of Dr. Douglas' work, in the opinion of the award committee, constituted the outstanding achievement in the plastics industry during 1943.

▶ WILLIAM A. LYONS has been appointed assistant to President Ralph D. Jennison of the New York State Electric & Gas Corp., Binghamton, N. Y. For the past fifteen years Mr. Lyons has been connected with the Associated Gas & Electric System in various financial, accounting and management capacities. Since 1941, he has been comptroller of NY PA NJ Utilities Co., the parent company of New York State Electric & Gas Corp., from which position he is resigning. Mr. Lyons has been on loan to the War Production Board as chief of the fuel and allocations branch, Office of War Utilities, since September, 1942. He resigned his position with WPB on April 30. Prior to joining the Associated System in 1929, Mr. Lyons was identified with the Consolidated Edison Co. of New York for five years. As assistant to the president of New York State Electric & Gas, he will have executive responsibilities in the office of the President in the fields of financing, accounting, tax and certain management matters. Otto C. Vieweg, who for sometime has been assistant to the president on general operating matters and other problems of a management nature, will continue in that capacity.

▶ EUGENE CARD, Wiremold Company representative in upstate New York for some years past, has become sales manager of the H. I. Sackett Electric Co., Buffalo, N. Y. Mr. Card's territory in eastern New York will be covered by GEORGE W. SUNDSTROM, New York district manager for Wiremold, and in western New York by J. E. LOVE, Pittsburgh district manager for that company.

▶ CORLISS A. BERCAW has been appointed assistant general manager of Elliott Co.'s Springfield, Ohio, Division. Mr. Bercaw was formerly a Baldwin Locomotive and a Westinghouse executive. A naval ensign and aviator in World War I, he joined Westinghouse after his discharge from service, as an engineer, and became special representative of the diesel engine division. He was associated with the Baldwin Locomotive Works as sales manager of diesel locomotives and later production manager of the diesel engine division

Every branch of the Armed Services uses the telephone. No. 11 of a series, Infantry.



Battle Talk! . . . that is what he handles on this portable switchboard. Close behind our advancing troops, he holds the life lines of men in combat. Through these lines, flow reports from outposts, orders from command posts—helping to win objective after objective on the road to Victory, Home and Peace.

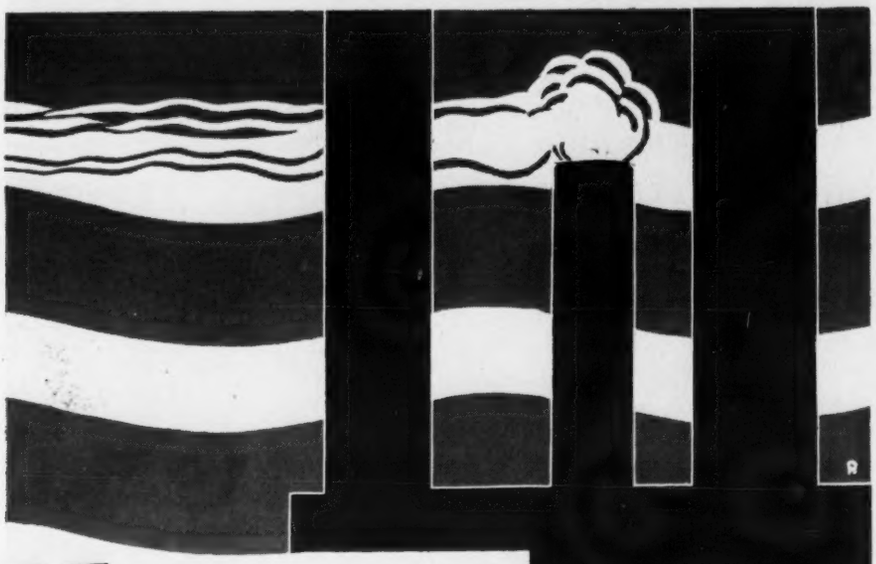
75TH ANNIVERSARY

Western Electric

IN PEACE...SOURCE OF SUPPLY FOR THE BELL SYSTEM.
IN WAR...ARSENAL OF COMMUNICATIONS EQUIPMENT.

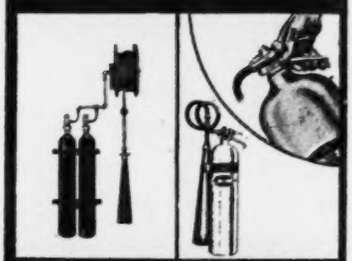
What can he do with your money?

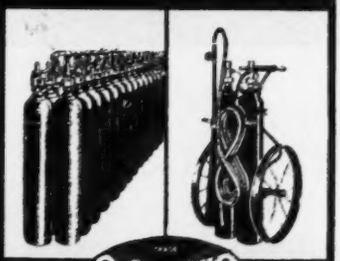
He and his comrades can win this war with it—when you turn your dollars into weapons. The cost of winning is high—but dare you think of the cost of NOT winning? Make sure of Victory—*invest every dollar you can in War Bonds!*



Victory Also Depends on Safeguarding the Home Front *against* FIRE!

In these times of record-breaking production, fire protection in plants may be more or less taken for granted. But is your extinguishing equipment modern? Would a fire in your plant cause a shutdown if the extinguishing methods resulted in as much or more damage than the actual fire? Carbon dioxide is the fastest known non-damaging fire extinguishing agent. It extinguishes fire in split seconds and there will be no damage to machinery or materials. C-O-TWO kills fire with a withering blast of sub-zero gas which penetrates and kills hard-to-get-at fires that cannot be reached with ordinary methods. And for added protection:—C-O-TWO Smoke Detecting Systems automatically discover fire the instant smoke appears. C-O-TWO is Faster—It's Safer—It's Modern.





C-O-TWO is a registered trademark and corporate name of this company. C-O-TWO is inspected and labelled by the Underwriters' Laboratories; approved by Factory Mutuals and the Bureau of Marine Inspection and Navigation. To be safe specify C-O-TWO.

C-O-TWO

C-O-TWO FIRE EQUIPMENT COMPANY

NEWARK 1, NEW JERSEY

Sales and Service in the Principal Cities of United States and Canada

before joining Elliott Company. Mr. Bercaw is a member of the American Society of Mechanical Engineers.

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Westinghouse Assigns New Duties to McKibbin

John M. McKibbin, formerly manager of the application data and training department of the Westinghouse Electric & Manufacturing Co., has been appointed assistant to the vice-president.

Mr. McKibbin's new responsibility will include all products and industry advertising, in addition to his present duties.

Mr. McKibbin joined Westinghouse in 1922 as a member of the promotion division in Pittsburgh and subsequently served as advertising manager in Cleveland and in Detroit. When the central district of Westinghouse was formed with headquarters in Pittsburgh, Mr. McKibbin was placed in charge of the company's advertising activities in the industrial areas of Ohio, Pennsylvania, Michigan, Kentucky and West Virginia. Later his offices were moved to East Pittsburgh where he supervised promotional operations involving all industries served by Westinghouse equipment.

In 1936 he was appointed apparatus promotion manager to co-ordinate all such activities, except those involving Westinghouse merchandising equipment, at headquarters and in district offices. The following year he was appointed head of the application data and training department.

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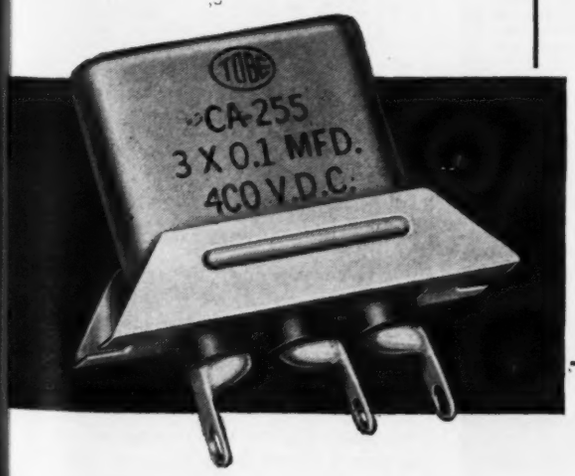
► WILLIAM D. TURNBULL, who for the past four years has been vice-president and sales manager of the Pomona Pump Co., resigned recently to become manager of the Westinghouse Electric & Manufacturing Co.'s agency and specialties department. Mr. Turnbull formerly was associated with Westinghouse from

OLD FAITHFUL GEYSER, Yellowstone National Park. Geologists believe it began erupting before the last glaciation, about a million years ago. Within record, Old Faithful has erupted continuously at about 65-minute intervals, spouting a column of water 95—130 feet high for 4½ minutes.

STILL GOING STRONG

LONG, UNINTERRUPTED service under all operating conditions is the characteristic you want most in a capacitor. Tobe Capacitors serve so well and so long because every step in their manufacture is checked and cross-checked by rigid inspections. Constant improvement through constant research is the promise performed by Tobe engineers. An example is the Tobe CA-255 Capacitor, shown below, now available in a new drawn container of improved construction. Why not call on Tobe for prompt, specialized help on your capacitor problems?



SPECIFICATIONS—CA-255

Mineral Oil Impregnated and Filled. Aluminum Foil. Highest Grade Kraft Tissue.

CAPACITY RATING..... 3 x .1 mfd.
VOLTAGE (working).....400 V. D. C.
DIMENSIONS: 1 11/16" wide: 9/16" deep: 2 7/16" long, including channel mounting bracket. Mounting centers 2⅛". Three terminals ½" on centers. Height of terminal ¾". Diameter of mounting holes, .144.

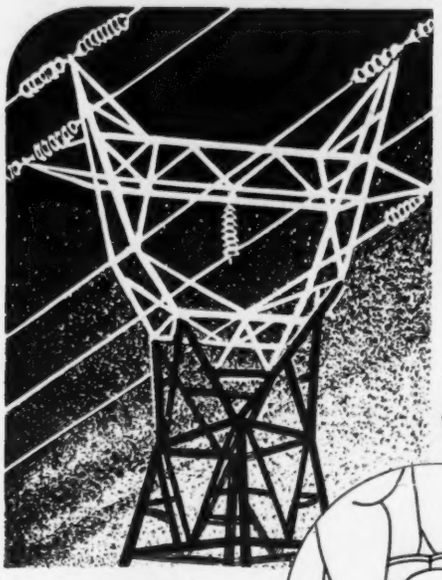
FEATURES: Rugged Channel Mounting Bracket securely soldered to container . . . Increased terminal insulation . . . Rigid terminal lugs afford ample space to handle No. 14 stranded wire . . . Improved streamlined drawn container instead of fabricated can . . . Type, capacity and voltage die-stamped on container. Meets U. S. Army Signal Corps Specifications 71-516-E.

Other values and voltages may be obtained in above mentioned container construction. Send for details of our "OM" and "OD" Capacitors.

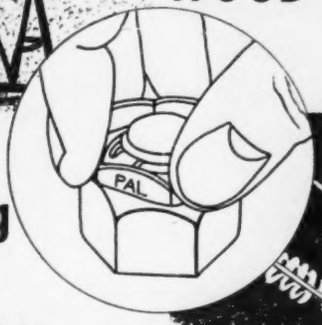
TOBE DEUTSCHMANN CORP. TOBE CANTON · MASSACHUSETTS

A small part in Victory today...

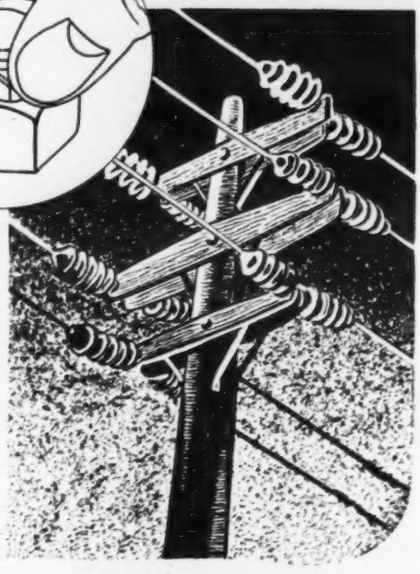
A BIG PART IN INDUSTRY TOMORROW!



KEEP BOLTS TIGHT ON STEEL TOWERS AND WOOD POLE LINES



Add Double-Locking PALNUTS To New And Old Lines!



For over 10 years, Double Locking PALNUTS have been keeping bolt-and-nut assemblies tight on steel towers, wood pole lines, cross arms and braces, insulator pins, clevises and clamps.

PALNUTS are single thread locknuts made of tempered spring steel. They are easily, quickly spun on top of the regular nut, locked tight with 1/3 turn of the linesman's wrench. When locked, PALNUTS exert a powerful double-locking action* on both nut and bolt, preventing loosening under vibration or shrinkage of parts.

When applied on new installations, PALNUTS save further check-ups and re-tightening. Maintenance crews checking old installations can add PALNUTS without disturbing regular nut. Only 3 bolt threads space are required. PALNUTS are very low in cost; may be removed and re-used. They are available in a full range of sizes, in Hot Dipped Galvanized or other finishes and materials used by the Utility industry.

Send details of your needs for samples. Write for Palnut Manual No. 1 and detailed folder on power line applications.

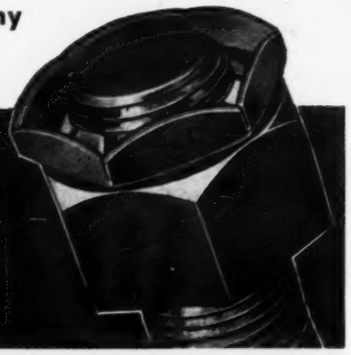
*** DOUBLE LOCKING ACTION**

When the PALNUT is wrench - tightened, its arched, slotted jaws grip the bolt like a chuck (B-B), while spring tension is exerted upward on the bolt thread and downward on the nut (A-A), securely locking both.

The Palnut Company
51 Cordier Street
Irvington 11, N. J.

Used Today on Aircraft, Tanks, Jeeps, Military Vehicles and other War Equipment

DOUBLE-LOCKING **PALNUTS**



1923 to 1940, serving in the company's sales division. For his work as manager of mining and petroleum electrification and later as manager of the machinery electrification section, he was awarded the "order of merit".

•

Nash-Kelvinator Elects Lawson Vice-President

Charles T. Lawson, general sales manager of the Kelvinator Division, has been appointed a vice-president of the Nash-Kelvinator Corp. As vice-president in charge of sales for the Kelvinator Division, Mr. Lawson's broadened responsibilities will better enable him to plan and execute a program of expansion for Kelvinator in the major appliance field.

Mr. Lawson has been with Kelvinator since 1939, only interrupting his sales activities for a period early in the war to participate in the company's extensive war production program. Prior to joining Kelvinator, Mr. Lawson, since 1932, had been an official of Frigidaire, becoming household sales manager in 1934. He was general sales manager of the General Motors Radio Corp. in Dayton, Ohio, for three years prior to 1932. Following service in World War I, he was associated with the Westinghouse company until 1921, leaving to become general sales manager and later vice-president of the Day Fan Electric Co., Dayton, Ohio. Mr. Lawson holds degrees in both mechanical and electrical engineering from Virginia Polytechnic Institute.

•

► F. Lowell Garrison, formerly sales manager of the General Electric Supply Corp., Butte, Mont., recently succeeded Paul C. Wilmore as public relations manager for the West Coast. His headquarters are in San Francisco. Mr. Wil-

Wakefield's Postwar Policy:

TO HELP YOU PROVIDE ENGINEERED LIGHTING

According to our present thinking, we will be more dependent than ever upon the power companies for the marketing of our products. Our resident engineers will do their best . . . but we'll need your help, too.

Because we realize that many utilities will have a surplus of energy, we plan to continue the policy of developing lighting equipment especially suitable for central station recommendation and sales purposes—depending, of course, on the policies of the companies in the various localities.

However, for 37 years we have carried on the distribution of our lighting products through the wholesaler, and we do not contemplate any major change in this respect.

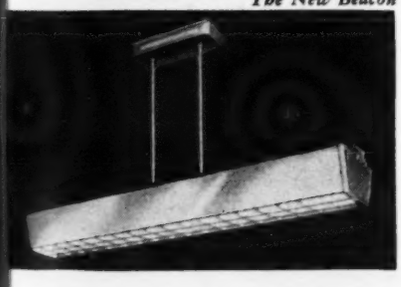
TODAY, practically all of our war work has to do with lighting problems for the various branches of the Service.

This fact, as well as the enforced use of substitutes, has called upon us to use ingenuity, more ingenuity than ever before. And we can't help but feel that the development of this talent will lead us to some unusually interesting lighting equipment applications for after the war.

Sincerely,

A. F. Wakefield

The New Beacon



Are You Ready? Is your lighting department set up for the future ahead? Already some 84% of the nation's department stores have indicated that they are planning new lighting. Chain stores have their plans under way. And there's the modernization of office buildings, of schools and many other public buildings. Keen utilities are planning *now.* We will be glad to work with you.

THE F. W. **Wakefield** BRASS COMPANY

RED ● SPOT LIGHTING FOR WAR PRODUCTION . . . FOR PEACETIME FUTURE

VERMILION, OHIO

WILEY BOOKS IN

ELECTRICAL ENGINEERING

Post-war plans in your field are being made now. This, then, is the time to prepare for new duties. Look over the important titles listed below. Make your selection and order today from the coupon.

CONTROL OF ELECTRIC MOTORS—2nd Edition

By Paisley B. Harwood

528 Pages $5.00

Crammed with practical, up-to-date, original data for the electrical engineer interested in the design, construction, installation, and operating characteristics of electric motors and control devices. New chapters cover synchronous motor control, single-phase motor control, and variable-voltage control.

BASIC MATHEMATICS FOR ENGINEERS

By Paul G. Andres, Hugh J. Miser, and Haim Reingold

726 Pages $4.00

Presents the algebra, trigonometry and analytical geometry (plus a brief introduction to differential and integral calculus) needed for an intelligent understanding of fundamental science and engineering.

MATERIALS AND PROCESSES

Edited by J. F. Young

628 Pages $5.00

An extremely helpful volume, offering a broad background for the design engineer. Tells how to choose the right material for designing, and how to design the product so that it is proportioned with respect to the material to be used, and detailed to accommodate the method of processing.

WORK METHODS MANUAL

By Ralph M. Barnes

136 Pages $1.75

A brief volume on the fundamentals of good work methods, for shop foremen, supervisors and workers. Includes a full discussion of process charts, man and machine charts, and operation analysis.

ECONOMY LOADING OF POWER PLANTS AND ELECTRIC SYSTEMS

By Max J. Steinberg and Theodore H. Smith

203 Pages $3.50

Explains the fundamental theory of incremental rates and its application in the solution of load-division problems encountered in the production and transmission of electrical energy.

HOW TO PASS RADIO LICENSE EXAMINATIONS—2nd Edition

By Charles E. Drew

320 Pages $3.00

Newly revised and brought up to date, this well-known book—in question-and-answer form—offers much helpful material to amateur radio operators, radiotelephone and telegraph operators, whether interested in broadcasting, marine, aeronautical, or any other field of radio transmission and reception.

MODERN TURBINES

By Louis E. Newman, Allen Keller, John My Lyons, and Lawrence B. Wales

170 Pages $2.50

A practical and authoritative discussion on the selection and characteristics of turbines, which power-plant operators, mechanical and electrical engineers will find valuable for constant reference.

CIRCUIT-ANALYSIS OF A-C POWER SYSTEMS—Vol. I

By Edith Clarke

540 Pages $6.00

A valuable source of practical material; helps electrical and consulting engineers to understand symmetrical and related components, and the solution of unbalanced power systems.

MAGNETIC CIRCUITS AND TRANSFORMERS

By the Electrical Engineering Staff of the Massachusetts Institute of Technology

718 Pages $6.50

A thorough treatment of the principles associated with the concepts of interlinked electric and magnetic circuits and their application to the analysis of transformers. Practical applications are made both to heavy-current power and light-current control, measurement and communications problems.

ENGINEERS' DICTIONARY

Spanish-English and English-Spanish

Compiled by Louis A. Robb

423 Pages *Flexible Binding* $6.00

A practical, up-to-the-minute dictionary of engineering terms, expressly prepared for Pan-American use. Uses the Spanish of Central and South America, with hundreds of specific local terms.

TRANSIENTS IN LINEAR SYSTEMS—Vol. I

By Murray F. Gardner and John L. Barnes

389 Pages $5.00

For electrical and mechanical engineers, a simple treatment of linear invariant physical systems. Includes such subjects as the nature of transients, the Laplace transformation, transformation of elementary functions, and the transformation and algebraic solution of equations.

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Please send me on ten days' approval the books I have checked in this advertisement (or I am attaching to this coupon a separate list of books desired). At the end of that time, if I decide to keep the books, I will remit indicated price plus postage; otherwise I will return the books postpaid.

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EW-5-27-44

more has been transferred to Cincinnati, to head the new household distribution branch in that city.

►W. O. EVERLING has been appointed director of research of the American Steel & Wire Co., succeeding the late **J. S. Richards. R. H. BARNES** has been named assistant director of research to replace Mr. Everling. Mr. Everling joined American Steel & Wire Co. in 1930. Mr. Barnes has worked for the organization since 1920.

OBITUARY

Hildreth R. Peckham

Hildreth R. Peckham, vice-president in charge of operations of the San Diego Gas & Electric Co., died recently at his home in San Diego Calif., at the age of 56. A native of St. Louis, Mo., with a degree in civil engineering from Princeton, Mr. Peckham was engaged in railroad and public utility projects in Indiana and Tennessee before joining the San Diego company.

He served the utility as engineer, department superintendent, general superintendent and vice president. In the latter position he had charge of all construction work and operations of the company's gas and electric plants and distribution systems, and was instrumental in the building of the recently completed Silver Gate generating station.

•

N. E. Drexler

N. E. Drexler, formerly president of the Tidewater Power Co., Wilmington, N. C., died suddenly at his home in that city on May 17.

Mr. Drexler resigned as head os the Tidewater Power Co. last month because of ill health (ELECTRICAL WORLD, May 6, page 17).

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►HAROLD D. FAIRWEATHER, a vice-president of the Colt's Patent Firearms Manufacturing Co., former treasurer of the Manufacturers Association of Connecticut and a member of the Colt's board of directors until he resigned recently because of ill health, died on May 13 at his home in West Hartford, Conn. He was 58 years of age.

►ALBERT E. DYMENT, widely known in business circles in Canada and for many years prominently identified with the Canadian General Electric Co., died on May 12 in a Toronto hospital at the age of 75. Mr. Dyment had been a hospital patient for about two years except for a brief interval. He retired as chairman of the board of directors

of the Canadian General Electric Co. in 1941. Mr. Dyment was first elected to the company's board in 1907, and had served as vice-president and president of the company before his election to the office of chairman of the board of directors in 1925.

▸ CLIFFORD D. BARTON, manager of the municipal light and water plant at Forrest City, Ark., for 23 years, died on May 15 in an ambulance between Little Rock and Forrest City. Mr. Barton, who was attending the annual meeting of the Arkansas Utilities Association in Little Rock, became ill late the night of May 14, and had started back to Forrest City. He was 61 years old.

▸ CALVIN A. SLAYTON, 71, for the past 40 years superintendent of the Morrisville (Vt.) Electric Light Department, died on May 8.

▸ HERBERT W. MOSES, 66, former head of the industrial relations department of the Boston Edison Co., and for many years a nationally known authority upon safety engineering and personnel problems, died in Boston on May 14. He was graduated from Harvard College in 1900 and was manager of the Chelsea (Mass.) Gas Light Co. until its electrical department was merged in the formation of the then Edison Electric Illuminating Co. of Boston under the leadership of the late Charles L. Edgar. In 1912 Mr. Moses directed the still celebrated electric show at Boston, staged in the Mechanics Building. Mr. Moses retired from the Boston utility in 1942.

▸ ARTHUR C. HARRIS, power engineer of the Wisconsin Electric Power Co. at Racine, died at his home in that city on April 5 after an illness of two months. He was 68 years of age. Mr. Harris had been with the Milwaukee Electric Railway & Light Co. and the Wisconsin Electric Power Co., its successor, since 1910.

▸ JAMES H. FORSYTHE, 78, former manager of the municipal electric light department at Chicopee, Mass., and previously electrical superintendent of the United Electric Light Co., Springfield, Mass., died at Pittsfield, Mass., on May 4.

▸ GEORGE H. SHILL, assistant to Hardage L. Andrews, vice-president in charge of General Electric Co.'s appliance and merchandise department, died on April 27 in the Bridgeport (Conn.) Hospital. He had been identified with the General Electric Co. since 1920 and for the past three years served as assistant to the manager of the appliance and merchandise department with the responsibility of the broad development of the plastics department.

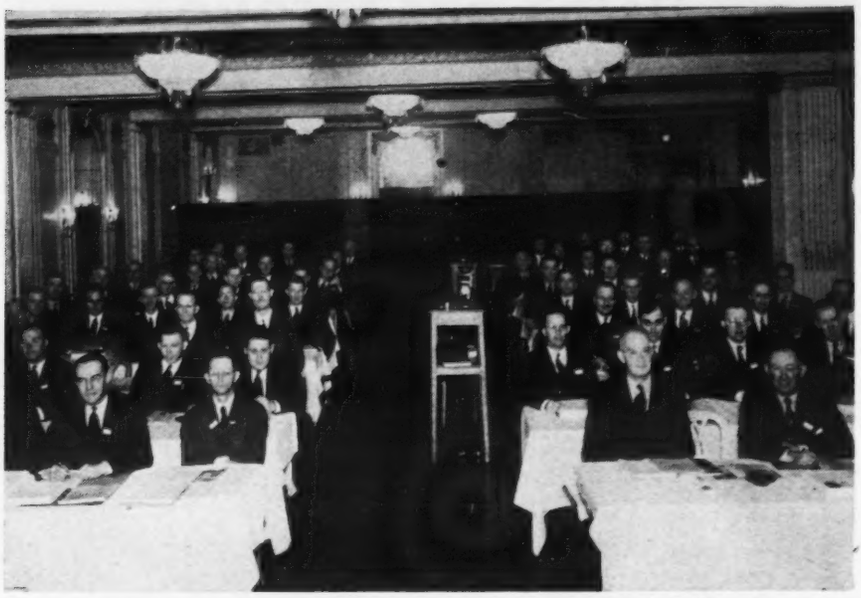
One of the first pieces of equipment landed on a newly established beachhead is the Army's high powered, mobile SCR-299. In half-track or truck, this Hallicrafters-built GIANT OF MILITARY RADIO is a vital link in the chain of communications. Subject to the bombing and shelling of the enemy, the sturdy SCR-299 can really take it—and dishes it out by getting the message through to direct the fire of land, sea and air forces.

hallicrafters RADIO
THE RADIOMAN'S RADIO

BUY A WAR BOND TODAY!

THE HALLICRAFTERS COMPANY, CHICAGO 16, U. S. A.

MANUFACTURING MARKETS



ELECTRONICS INSTRUCTORS — Representatives of leading New England utility, industrial and marine companies taking a highly appreciated three-day intensive course in industrial electronics at Boston under the auspices of the Westinghouse company. Each will later act as an instructor in this field for a group of 25 to 100 men in his own plant. The course was conducted by W. I. Bendz, F. S. Snyder and E. B. Ankenman of the Westinghouse Boston office, the lectures being supplemented by a series of ten films and lesson books

Worthington Buys Minneapolis Plant

Purchase of Electric Machinery Manufacturing Co., Minneapolis, Minn., by Worthington Pump & Machinery Corp., Harrison, N. J., has been announced by Harry C. Beaver, president of Worthington, and Walther H. Feldmann, president of Electric Machinery.

Second important acquisition by Worthington within a year, Electric Machinery's major lines of synchronous motors for direct drive for a wide variety of power plant and industrial machinery, as well as electric generators from steam and internal combustion engines, provide a logical extension of Worthington's power and industrial Equipment lines, Mr. Beaver declared.

Electric Machinery will continue to operate independently of the other Worthington activities. Its present executive personnel, Walther H. Feldmann, president; O. A. Soderstrom, vice-president in charge of manufacturing; R. H. Olson, vice-president in charge of sales, and Fred W. Hotchkiss, secretary and treasurer, will continue in those capacities.

The other recent Worthington acquisition took place in July, 1943, when Ransome Machinery Co., Dunellen, N. J., became a wholly owned subsidiary.

•

RCA, Victor, Conducts Electronics Course

With the purpose of presenting to utilities the potentialities of electronics as far as load-building is concerned, RCA Victor Division of the Radio Corp. of America conducted an Electronics Institute in Camden, N. J., May 16-19.

At the opening session, D. J. Finn, RCA Victor Division, outlining the purpose of the Institute said in part: "You expect, as a result of the time spent at RCA, to be in a better position to render a service to your customers—to be able to advice them more intelligently as to their needs and requirements and as to how they might best schedule some of their post-war plans around this new science of Electronics. We, in turn, hope to benefit by your contacts with your industrial customers—first, through the sale of any Electronic equipment that may meet your customers' needs, and, secondly, by the very fact that, in many instances, you will act as check-mates on those who may become over-enthusiastic and thus be inclined to over-burden our engineers with considerations of impractical application ideas. . . ."

•

Electric Men to Formulate NAM "Spending" Program

The electrical industry is furnishing leadership in the National Association of Manufacturers' new effort to "sweat down the nation's overspending" through the creation of a Government Spending Committee.

Robert Gaylord, NAM president, recently announced the following had accepted membership in the nation-wide group: James Hill, Jr., Arkansas-Missouri Power Corp., Blytheville, Ark.; H. H. Fogwell, Thermador Electrical Mfg. Co., Los Angeles; A. F. Metz, the Okonite Co., Passaic, N. J.; Robert L. Wiley, Standard Insulation Co., East Rutherford, N. J.; W. F. Parker, Standard Transformer Co., Warren, Ohio; S. J. Evans, Tri-City Traction Co., Princeton, W. Va.; and R. K. Schriber, United States Motors Corp., Oshkosh, Wis.

The group is commissioned by NAM to proceed through a series of studies and meetings "to determine and develop spending policies that will be in the best interests of our 50 million taxpayers."

•

Hotpoint Survey Reveals Appliance Requirements

Results of a survey made by the Edison General Electric Appliance Co., Inc., Chicago, to determine what type of household equipment will be bought after the war, indicate that 55 percent of 4,000 persons responding to the survey will buy electric ranges; 45 percent, water heaters; 52 percent, refrigerators; 57 percent, clothes washers; 40 percent, ironers; 44 percent dishwashers.

A question regarding the age of present appliances showed that ten years is the age of approximately 20 percent of the ranges, refrigerators, water

Sound the Alert!

MANAGEMENT
LABOR

—for the 5th War Loan drive during June and July. The need for the 5th War Loan is immediate, crucial. For impending events may make the 5th the supreme financial effort of the war.

The U. S. Treasury has set the overall goal at $16,000,000,000 — $6,000,000,000 from individuals alone. This is the biggest sum ever asked of the American people—*and it must be raised.*

That's why the U. S. Treasury asks Management and Labor to sit down together and organize—NOW!

For organization—good organization—has been responsible for the excellent showing of the payroll market. And its most important single superiority has been personal solicitation—desk to desk, bench to bench, machine to machine personal solicitation. 71% of all persons on payroll deductions were solicited for the 4th War Loan.

Now, to personal solicitation, add the sales incentive of a definitely established plant quota. Build your campaign around a quota plan. Set up departmental goals. Stress percentage of participation figures. Stimulate group enthusiasm.

In planning your quota campaign, work in close cooperation with the Chairman of your War Finance Committee. Everything is set to make the 5th War Loan drive a huge success—with your help!

(Note: You've read this message. If it doesn't apply to you please see that it reaches the *one* person who can put it in action!)

Here's the Quota Plan:

1. Plant quotas are to be established on the basis of an *average* $100 *cash* (not maturity value) purchase per employee.
2. Regular Payroll Savings deductions made during the drive accounting period will be credited toward the plant quota.
3. 90% of the employees are expected to contribute toward raising the cash quota by buying extra 5th War Loan Bonds: 1—Outright by cash. 2—By extra installment deductions. 3—By extra installment deductions plus cash.

Example: **JOHN DOE Mfg. Co.** — 1,000 Employees

1,000 employees x $100 Regular Payroll deductions during the eight weekly payroll Accounting Periods of June and July	=	$100,000 Cash Quota 30,000 $70,000 (to be raised by sales of extra Bonds to at least 900 employees)

ORGANIZE • SOLICIT • DELIVER

5TH WAR LOAN

The Treasury Department acknowledges with appreciation the publication of this message by

ELECTRICAL WORLD

★ ★ *This is an official U. S. Treasury advertisement—prepared under the auspices of Treasury Department and War Advertising Council.* ★ ★

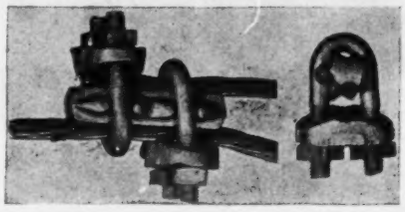
Guy Strand Clamping Simplified

The M.I.F. PAX67 Single and PAX69 Double Guy Clamps illustrated make possible these simplified specifications for dependable clamping of loops in guy strands, at each clamp location.

(1)—Use *one* PAX67 Guy Clamp for any strands from ¼" diam. to ⅜" diam., incl., in grades including high strength (10M ⅜" guys), or up to ½" diam., incl., for strands of lower rating.

(2)—Use two PAX67 Guy Clamp, or *one* PAX69 Guy Clamp for strands of higher rating (16M and 20M guys) up to ½" high strength, incl.

The "come-along" grip provided by the tilting of the U-bolt as the elastic limit of the guy strand is exceeded, and the increased contact area provided by the Separator with V-grooves between the load and tail strands, account for the greatly increased holding grip and efficiency with minimum injury to strands. Test results from laboratories of leading producers of guy strands, showing safety factor above these suggested specifications, have now been confirmed by their successful use in the field leading to repeat orders.



The illustration features PAX69 Double Clamp after breaking ½" (7x6) 30% L.H.S. Copperweld strand at 22,670 lbs. with efficiency of 97.5%. The PAX67 Single Clamp is shown at right, end view, indicating facility of threading strand loop through Clamp without disassembling same.

Prices—PAX67 Clamp @ $24.50/C., net, and PAX69 Clamp @ $47.60/C., net, F.O.B. Branford. Shipping Wts. approx. 120 lbs. per C. and 230 lbs. per C., resp. Lower unit prices for larger quantities, and we will accept initial trial order for any smaller quantities of either Clamp at the 100-lot prices listed.

MALLEABLE IRON FITTINGS COMPANY
Pole Hardware Dept. [Factory and New England Sales Office] Branford, Connecticut
New York Sales Office: Thirty Church Street
Canadian Mfg. Distributor:
LINE & CABLE ACCESSORIES, Ltd., Toronto

heaters, and clothes washers. Slightly more than 10 percent of these appliances are 15 years old. The answers show that more than 80 percent of all these appliances are four or more years old.

•

Maritime Commission Gives More Awards

Crocker-Wheeler Electric Manufacturing Co., of Ampere, N. J., won the Maritime Commission's "M" award, given for outstanding production records, for manufacture and development of special electrical equipment for ships, the commission announced recently.

Curtis Lighting, Inc., was awarded its first gold star for its previously-earned "M."

The Erie, Pa., plant of the General Electric Co. won its second gold star.

•

Electric Companies Join

Announcement has been made of the consolidation of Schwarze Electric Co. and Stanley & Patterson Division into the Faraday Electric Corp., Adrian, Mich. Heretofore, Schwarze Electric Co. and its Stanley & Patterson Division operated as a limited partnership. There will be no change in ownership or operating personnel.

•

Westinghouse Will Make Radio Receivers Again

Westinghouse Electric & Manufacturing Co., which discontinued the manufacture of home receiving sets in 1928, plans to reenter this field as soon as war conditions permit, Walter Evans, vice-president in charge of the company's radio division, Baltimore, Md., has announced.

"We feel that for several reasons the post-war period offers an unusual opportunity to return to such production," he said. "With the obsolescence and wearing out of a large portion of the approximately fifty million sets in use at the start of the war, the requirements of the public will place demands on the industry far above the pre-war volume," Mr. Evans said.

•

Moves Portland Office

Cutler-Hammer, Inc., Milwaukee, Wis., has announced the moving of their Portland sales office to new quarters in the Security Building, 131 S. W. Fourth Av., Portland 4, Oregon. Frank J. Woldrich, sales engineer, is in charge of the Portland office.

Field Reports on Business

Manufacturers' facilities remain occupied with production of goods for war. Military demands are leaving but a small percentage of productive capacity of even priority civilian goods. Backlog of orders held by electrical manufacturers is increasing on motors, transformers and line materials.

NEW ENGLAND

Electrical lighting projects for commercial, institutional and industrial establishments are absorbing widespread attention. Store modernization has taken a new lease on life; office building corridor improvements are noted, and textile mills in New Hampshire have completed major betterments. Special lighting will be a feature of Boston's $1,000,000 war veterans' memorial (post-war) which has been planned by Maginnis & Walsh, Boston. Small wiring contracts are gaining; changes and additions to the Boston South Postal District building will be handled by R. E. Harris, Boston. Communications systems and control signals will be installed in a new gunnery range to be built on the Massachusetts seaboard by Campanelli & Cardi, Providence, R. I., and wiring supplies will be bought for a $51,655 school for South Portland, Me., and a $31,496 commissary building under contract to O. Ahlberg & Sons, Cranston, R. I.

Riley Stoker Corp., Worcester, Mass., has received a contract to install a boiler and accessories at the Norfolk (Va.) navy yard at a cost of $137,220. Production quotas announced by WPB for electric irons for New England firms are 97,868 to Verplex Company, Essex, Conn., and 25,000 irons to Winsted Hardware Manufacturing Co., Winsted, Conn.

The tempo of bidding on supplies for the armed services continues steady. The demand for telephone wire, electric cable, lamp cord, and small switches is very good as a result of much activity on marine railways where repairs and outfitting attract a steady movement in electrical supplies. A Connecticut firm has submitted bids for 7,400 pairs of electricans' wire cutters and Rhode Island firms bid on motor-driven bench grinders, centrifuges and accessories, and insulating materials. Capacitors and resistors are in urgent demand, and Connecticut non-ferrous plants are supplying large amounts of welding rod to local shipyards.

CHICAGO

Electrical industry activity here continues to reflect war conditions. Manufacturers' facilities remain chiefly occupied with production of goods for the military services and eastern European Lend-Lease. It is notable that the bulk of present war contract production is on items identified with normal peacetime commercial products; a fact which points to speedy post-war conversion.

Military demands are leaving but a small percentage of productive capacity for even priority civilian goods. Under the influence of more liberal government restrictions and depleted utility inventories, the backlog of orders held by manufacturers is steadily increasing; particularly in many lines associated with distribution construction and to a lesser degree transmission. Delivery dates are stretching out and may be expected to grow longer under the three-fold pressure of volume war goods production, growing utility buying activity and an increasingly stringent labor supply.

The order backlog situation is most serious on motors, transformers, meters and instruments, and line construction specialties. Motor manufacturers are quoting deliveries into next year on fractionals; eight months on integral sizes. One manufacturer reports a distribution transformer backlog of 20 months on the production basis permitted under the present freeze order. The meter situation is reported to be improved somewhat, although it is still far from easy. Manufacturers are reported to be now producing meters in numbers permitted by the freeze orders; a condition that did not prevail earlier this year due to preoccupation with radio and radar production for war.

NEW YORK

Industrial activity continues to reflect war conditions. Trading on the New York Stock Exchange last week was at an accelerated pace, investors being less nervous over the invasion prospect than in the preceding weeks.

Civil engineering construction volume in continental U. S. totaled $26,907,000 last week. This volume was 36 percent lower than the preceding week, 58 percent under the total reported by *Engineering News-Record* for the corresponding 1943 week. Private work was 30 percent lower than the the preceding week and down 5 percent compared with the 1943 week. Public construction was 39 and 68 percent lower, respectively, than a week ago and a year ago. The current week's construction brought 1944 volume to $706,134,000 for the 20-week period, a decrease of 51 percent from the $1,445,294,000 reported in 1943.

Retail trade in the Metropolitan area continued active last week. Estimates indicated department store volume ran ahead of the similar week last year by 15 percent.

PACIFIC COAST

The total value of April building permits in the seven western states increased 12 percent over April, 1943, largely because of the $6,393,000 by Los Angeles, which aided in doubing California's total and offset a 60 percent decrease in the Northwest.

Preference ratings have been requested for the $1,000,000 Newton and Scofield Irrigation System in Utah. Orders include turbine parts for plants in Rockies areas; hardware and cable for a river crossing of 115-kv. Bonneville Line between Eugene and Vancouer; relocating and augmentation of Beacon sites along San Diego—Tucson Airway; $50,000 of GE control equipment for an oil refinery; $30,000 of ammeters and $25,000 of armatures and spare parts for Navy yards in Bay area, and 5,000 fractional horsepower motors for calculating machine factory.

Major government contsruction includes a $1,834,000 award for carrier pier at Alameda naval air station, with low bids of $1,397,000 for its seaplane hangar and barracks and $1,169,800 for interim overhaul building; a $1,500,000 installation for third unit of amphibious training group at Oceanside.

Industrial developments include Santa Fe's proposed outlay of $850,000 for diesel and other shops at Barstow, Calif.; a hot dip galvanizing plant at Salt Lake City; and WPB's approval of $2,500,000 industrial alcohol plant from wood waste at Eugene, Ore.

NOW...

Reliable development, engineering, production and inspection personnel are licking a variety of tough problems for the U. S. Army Ordnance, Air Corps, Signal Corps and for the Navy Bureau of Ships and the Seabees. They are concentrating on shortening the war.

TOMORROW...

This personnel, keyed to get results in accurate and efficient production, will be ready to take on problems of neater and lower cost overhead distribution.

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ELECTRIC COMPANY
OVER 35 YEARS SERVICE TO THE UTILITIES
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Spokane Utility Upheld by Court PUD Ruling

In a five-four decision, the Supreme Court at Olympia recently handed down a three-point ruling on two appeals and a cross-appeal growing out of successful condemnation proceedings brought by the Public Utility Districts of Douglas and Okanogan Counties against the Washington Water Power Co.

The court held that earnings of the company upon its properties in the two counties must be offset against interest due the company between date of verdicts, setting compensation for condemned properties and the date of actual payment of awards. The court also held that the company was entitled to compensation for necessary improvements made upon the properties between the same two dates.

Judgment on the power company's appeal, directed at the Okanogan County case and presenting error upon the denial of challenges to four jurors on the ground of implied bias, was affirmed.

Proceedings in both counties had been consolidated for trial by Okanogan Superior Court Judge Ralph O. Olson and both were consolidated on appeal.

Awards made by trial court juries were $2,227,531 for company properties in Okanogan County, and $139,165 for Douglas County properties.

•

Canadian G.E. Production 90% Warwork in 1943

At the annual general meeting of Canadian General Electric Co., president D. C. Durland, stated that production during 1943 was approximately 90 percent in war work. Expansion of the company's production is indicated by the increase in the number of employees, approximately 10,000 in 1943, compared with 4,800 in 1939.

Unfilled orders carried over into the current year were equivalent to about eight months' output and the outlook is fairly promising for new business for 1944, he said.

•

Municipal Charges Higher

The average charge per kilowatt-hour for electricity under municipally operated systems in the province of British Columbia is higher than in the case where power is supplied by private companies and industrial organizations, according to a progress report just released by the Rural Electrification Committee of the British Columbia government.

FOR QUICKER EASIER TRIMMING WORK
use SEYMOUR SMITH TOOLS...
TREE TRIMMERS
POLE SAWS
BRUSH CUTTERS
CABLE CUTTERS
JOINTED TEST-PIKE POLES
A line of tools designed for linemen's use that are standard equipment with the world's largest Utility Companies.
Send for folder and prices of this labor saving equipment.
385 SEYMOUR SMITH & SON, Inc.

AVOID CABLE ABRASION *with*

STAPUT FAIRLEADERS

"Rubbing at the duct mouth can be reduced by installing fairleaders on the cables at this point." – from Electrical World, May 29, 1943 (Cables – How to Make Them Last).

These non-corrosive alloy cable shields clamp in place to take wear at duct mouth. Easily and safely installed without interruption of service. Eliminate expensive repairs. Use STAPUT FAIRLEADERS. *Write for free catalog.*

Wm B. Berry Co., 88 North St., Boston, Mass.

Subox

ANTI-CORROSIVE PAINTS

favored for

TRANSMISSION *and* DISTRIBUTION DEPARTMENTS MAINTENANCE

Subox, Inc.

NORTH ARLINGTON, N. J.

Facile Transition for Utilities Seen

In the readjustment to peacetime operations, the electric utility industry should have fewer and less perplexing problems than were encountered in adapting service and facilities to the war effort, according to a recent statement by James V. Toner, president of the Boston Edison Co. This industry will market the same product and use the same facilities now being utilized by the war plants. The problem of absorbing these millions upon millions of kilowatt-hours, Mr. Toner said, is a challenge to the industry's salesmanship, ingenuity and vision, but in order of magnitude it does not even approximate that of many other enterprises which must first change their plants to produce something they can sell.

Boston Edison is actively planning to resume appliance merchandising and servicing after the war shortage is relieved. Actual work on a central operating and administrative building will be started as soon as conditions permit. The a.c. network system in the d.c. area will be extended as soon as possible after restrictions are removed; transmission tie-ins will be extended to improve power source utilization and the normal peacetime policy as to distribution system extensions will be reestablished. Work has been started on the second 50,000-kw. unit for the Mystic steam station, with the expectation of its being ready for service in the latter part of 1945. Plans are also being considered to provide additional generating capacity at either L Street or the Edgar generating station for possible service in 1946.

•

Copper Wire and Cable Output at High Levels

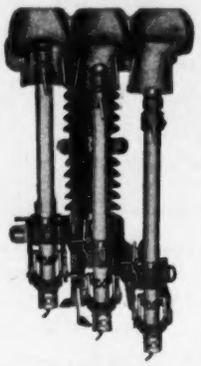
Deliveries of copper wire and cable during 1944 are expected to approximate 80 percent of the requirements for all uses, industry repersentatives told WPB at a recent conference.

Manpower shortages will handicap the industry in attempting to keep output at these levels, WPB was warned, and the supply of these items will remain tight.

•

Opens New Tulsa Office

Fairbanks, Morse & Co. has announced the opening of a new office in Tulsa, Okla. The office is under the management of Frank D. Ratcliffe, and is located at 1335 Hunt Building.



Mistakeproof Reclosers

Here's a provable fact: Order one or more Rural Line Reclosing Matthews Fuswitches on 30 days trial—Freight prepaid.

Give them to a line crew who are familiar with open type dropout cutouts.

Don't give them any instructions as to how to operate them.

If they are able to sincerely do anything wrong, send them back, freight charges collect, and our bill will be cancelled.

You can't lose. Will you send your order today? Ask for Bulletin 101.

W. N. MATTHEWS CORPORATION

ST. LOUIS, U. S. A.

PROTECTION *against* SHUTDOWNS *with*

TRICO OILERS

VISIBLE - AUTOMATIC - DEPENDABLE

Lubricant, like manpower, is worthless unless it is at the *right place* at the *right time*. In lubricating, avoid "too much . . . too soon" . . . as well as "too little . . . too late".

TRICO OILERS supply the needed protection by supplying the *right amount* at the *right time* **automatically.** There's no guesswork . . . no waste . . . no unnecessary production stoppages for repairs.

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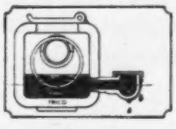
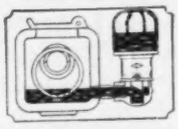


THE OLD WAY
with hand oiling, bearings either have too much or not enough oil. It's all guesswork.



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Oil level is **automatically** maintained. As oil is used up it is immediately replaced. No guesswork—no hazards.

SAVE OIL — TIME — WORRY
OIL SUPPLY IS ALWAYS VISIBLE
ELIMINATE HAND-OILING
NO PRODUCTION STOPPAGES
EASY INSTALLATION

TRICO FUSE MFG. CO. Milwaukee Wisconsin — FUSES

Test Insulation the Modern Way
with a MODEL B-5
MEGOHMER

VARIOUS NEW MODELS AND RANGES

NEW BATTERY-VIBRATOR TYPE

No more tiresome cranking of a hand-driven generator . . . Entirely self-contained, steady test potential of 500 volts DC, available at the touch of a switch. Direct reading in insulation resistance.

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WRITE FOR BULLETIN No. 430

ELECTRITE

A high grade fibre board for electrical insulation. A material of quality possessing high tensile and dielectric strength. Used by many of the leading manufacturers of electrical equipment.

DENSITE

An extremely hard board of superior quality which can replace the more expensive types of insulating materials.

Pulp Products Department

WEST VIRGINIA PULP & PAPER COMPANY
230 Park Avenue New York N.Y. 35 E. Wacker Drive Chicago Ill.

Sales Opportunities

KANSAS—War Department, Washington, D. C., has authorized expansion in army air force depot, including new warehouses and other structures, with mechanical and electrical equipment. Also will make extensions in distribution lines, service connections and power substation facilities. Entire project is estimated to cost about $867,000, and will be supervised by U. S. District Engineer Office, Kansas City, Mo.

MICHIGAN—Pontiac Division, General Motors Corp., Pontiac, plans extensions and improvements in plant for motor bus assembling for government service, with installation of machinery and electrical equipment. Cost about $522,000, with financing by Defense Plant Corp. Work is scheduled to begin at once.

LOUISIANA—City Council, Winfield, is completing surveys and plans for municipal electric distributing system and proposes to ask bids for work in June. Bond issue of $260,000 has been arranged for project. J. M. Fourmy, Hammond, is consulting engineer.

WASHINGTON—Bonneville Power Administration, Department of Interior, Portland, Ore., plans new transmission lines on five highways in Grant County, and has made application to Board of County Commissioners, Ephrata, for a 50-year franchise, scheduled to be granted early in June.

PENNSYLVANIA — Navy Department, Washington, D. C., plans expansion in naval aviation supply depot, including two new multi-story warehouses, totaling 4,000,000 sq. ft. floor space, to cost about $16,800,000, with mechanical and electrical equipment. Also new public works building and maintenance shop, addition to administration building and other structures, with extensions in electrical distribution lines, service connections and power substation facilities. Entire project will cost $18,400,000. Appropriation authorized and work will begin soon. Bureau of Yards and Docks, Navy Department, Washington, will be in charge.

WISCONSIN—City Utilities Department, Hartford, plans extensions in municipal power plant, including installation of new 2,500-kw. turbine-generator unit and accessories, boiler, cooling apparatus and miscellaneous equipment. Application is being made for a priority rating.

NORTH CAROLINA—Department of Public Works, Charlotte, R. W. Flack, city manager, plans installation of motor-driven pumping machinery with rated capacity of about 17,000,000 gal. per day, with controls and accessory equipment, in connection with extensions in water system to increase raw water supply from Catawba River. Entire project will cost about $150,000. Proposed to secure a priority rating.

NEBRASKA—War Department, Washington, D. C., will make extensions in army airfield, including additional hangar, shops, navigation trainer building and other structures, with mechanical and electrical equipment. Also, additions to electrical distribution system, service connections and power substation facilities. Fund of $635,900 has been authorized for program, which will be carried out under direction of U. S. District Engineer Office, Omaha. Work will begin at early date.

SOUTH CAROLINA—Raycord, Inc., Spartanburg, V. M. Montgomery, president and

"Jenne" Safety Holder

promotes safe, economical use of stiff, high-strength guy strands. Readily carried to location (wt. 11 lbs.) where proper guy length is drawn out through largest ring without attention at Holder.

30 days' free trial if not fully convinced by advantageous field use of over 500 units (up to 35 for single property) with only 1% returned as unsuitable—or, send for descriptive literature, including data on strands used.

Prices: $8.00 ea., net, F.O.B. Branford, for aluminum paint or red enamel finish. $1.00 net extra if fully galvanized.

Every overhead service truck should have one.

MALLEABLE IRON FITTINGS CO.
Pole Hardware Dept.
Branford Connecticut

ALL the strength and durability inherent in steel are combined—with definite economies—in *Crapo* Galvanized Steel Strand. Heavy, ductile, tightly-bonded zinc coatings, applied by the famous *Crapo* Galvanizing Process, provide lasting protection against corrosion.

Ask the distributor of *Crapo* Galvanized Products near you or write direct for further information!

INDIANA STEEL & WIRE CO.
MUNCIE INDIANA

treasurer, recently organized, has contracted with government for new local mill for manufacture of high-tenacity rayon cord for automobile tire production, comprising two-story building with machinery and electrical equipment for large capacity. Cost estimated at $480,000, with financing by Defense Plant Corp. Construction will proceed at once.

KANSAS—Water Department, Liberal plans installation of two motor-driven pumping units, with controls and accessories, in connection with extensions and improvements in municipal water system. Project will cost close to $50,000. Application has been made for a priority rating. Wilson & Co., Public Utilities Bldg., Salina, are consulting engineers.

MASSACHUSETTS—Bureau of Yards and Docks, Navy Department, Washington, D.C., has plans for expansion in power supply and distribution facilities at navy yard, including extensions in power substations, primary and secondary lines, service connections and other work. Cost estimated at $575,000, of which approximately $225,000 will be used for line construction, including system extensions in outside areas. Public Works Office at yard will be in charge.

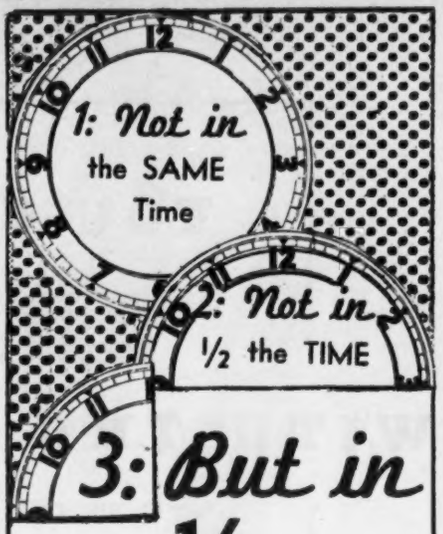
OKLAHOMA—Bureau of Reclamation, Denver, Colo., will receive bids until June 10 for three high-pressure gate assemblies, three bell-mouth inlets and three outlets pipes for installation in canal outlet at Altus Dam, Altus project, Okla. Equipment will be installed by government (Specifications 1738-D).

OREGON—Willamette Valley Wood Chemical Co., Eugene, Charles Snellstrom, president, Snellstrom Lumber Co., Eugene, head, has secured approval of WPB for proposed new plant for production of industrial alcohol from sawdust and wood waste. Plant will be located on 30-acre tract of land and will comprise several one and multi-story processing and production buildings, with machinery and electrical equipment for large capacity. A power plant and pumping station are planned. Entire project will cost about $2,247,000, according to revised estimates, and it is understood that financing will be provided by Defense Plant Corp. Smith, Hinchman & Grylls, Marquette Bldg., Detroit, Mich., are architects and engineers.

NEW MEXICO—War Department, Washington, D. C., has authorized expansion in army airfield, including two new air navigation trainer buildings, shops, warehouses and other structures, with mechanical and electrical equipment. Extensions will be made in electrical distribution lines, service connections and power substation facilities. Project is estimated to cost about $593,600, and will be supervised by U. S. District Engineer Office, Albuquerque.

MISSOURI—Chevrolet Motor Division, General Motors Corp., 6817 East 37th St., Kansas City, plans addition to power plant at local works, with installation of equipment. Bids are being asked for building erection and orders for required equipment will be placed separately. L. O. Willis, address noted, is company engineer in charge. Main offices are at 3044 West Grand Blvd., Detroit, Mich.

MICHIGAN—Mueller Brass Co., Port Huron, manufacturer of brass and copper extruded products, rods, tubing, etc., will carry out further expansion in plant for production for government, with machinery and electrical equipment. Cost about $425,000, with financing by Defense Plant Corp.



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A MUST for Utilities and Industrials
Dependable, Secure, Efficient Anchoring

THEY merely call for a swift turn or two of a special Allen wrench which is supplied without extra charge with the initial order.

It takes but a few minutes, as compared with the many minutes of laborious work with solder which EV-R-ONS have superceded. And when the connection is made, what a connection it is! The strands of the woven cable are actually CRUSHED under the tremendous gripping pressure of the contact surfaces. And they will STAY that way.

Send for full information

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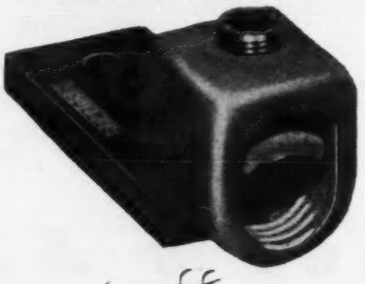

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Sales Agents: We now have some excellent open territories.

YOU CAN'T AFFORD TO

SHADOWBOX

WITH THE PAPER-BOX PROBLEM!

NO, SIR. Or with any other angle of the paper conservation problem. Our boys need every bit of paper and paper board the Army can get to ship their precious invasion supplies in. And it's up to you and every other manufacturer to cut and cut and cut again on the use of paper and paper board.

For every time a convoy sets sail—that's so much more paper and paper board in action. And the supply, as you know, is diminishing.

So your job is to figure every known way, yes, and a few unknown ways, to USE LESS PAPER AND PAPER BOARD.

Don't worry about the public, your public, squawking about your cutting down. The big all-out national drive right now is selling the public on the necessity for paper conservation. They'll be with you.

The green light is yours. Step on it.

If your company and your community have not already started Paper Conservation Committees, why not get them started now yourself?

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Paper vests have proved excellent for aviators and ground crews as cold protection.

Paper is used for disposable gun covers and ordnance wraps to protect such equipment while making invasion landings.

The Army supplies helmets of laminated fiber for non-combat duty in the tropics.

Many essential airplane parts are fabricated of plastic with a paper base.

Army trucks require 20 pounds of paper for safe delivery.

It takes 25 tons of blueprint paper to make a battleship.

USE LESS PAPER THESE WAYS

Review all printed forms periodically for essentiality; consolidation; elimination of waste space; standardization of sizes, weights, color, grade; elimination of color where possible.

Eliminate carton insert and/or directions when possible and substitute information on label.

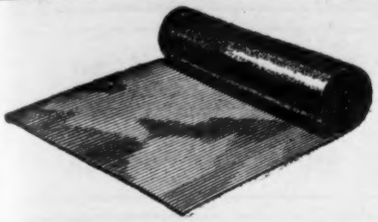
Overhanging, extended or padded carton tops should be eliminated unless they can be justified in a critical paper shortage.

Use and re-use carbon paper consistently.

Consider the possibility of reducing the length and increasing the diameter of tubular products as a means of conserving folding and set-up boxes.

Let's All Use Less Paper

This advertisement prepared under the auspices of the War Advertising Council in co-operation with the Office of War Information and the War Production Board.



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One of our many products designed for the Electrical Industry.

Ipco Switchboard Matting meets the requirements of high voltage, durability and appearance. 40,000 volt rating. Corrugated; non-slip; sanitary.

Thicknesses	¼"	⅜"	½"
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IPCO

Safety Equipment for all Industries

INDUSTRIAL PRODUCTS COMPANY

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AT 100 MC

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STABLE UNDER

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Temperature Extremes

Mechanical Stress

READILY MACHINED

Chemical Conditions

For complete technical data, send for Bulletin DN

CONTINENTAL-DIAMOND FIBRE COMPANY

NEWARK 15, DELAWARE

DE

Recent Rate Changes

Public Service Co. of Indiana has made a reduction in rates which will save some 200,000 consumers in 69 Indiana counties more than $400,000 annually for electricity, following an agreement with the Indiana Public Service Commission, which said the "door is left open for further changes if business conditions and the level of operating costs warrant them within the next year or so." George N. Beamer, chairman of the commission, said that residence, rural, and commercial customers will benefit. The new rates are as follows: Class A, first 40 kw.hr., 5.5 cents per kilowatt-hour; next 35 kw.-hr., 4 cents; next 125 kw.hr., 2.5 cents and more than 200 kw.-hr., 2 cents; Class B—First 40 kw.hr., 6 cents per kilowatt-hour; next 35 kw.-hr., 4 cents; next 125 kw.-hr., 2.5 cents and more than 200 kw.-hr., 2 cents; Rural—First 40 kw.-hr., 6.5 cents per kilowatt-hour; next 35 kw.-hr., 4.5 cents; next 125 kw.-hr., 3 cents; and more than 200 kw.-hr., 2 cents. Minimum charges are set at $1 for A and B customers and $1.50 for rural users.

Corinth Electric Light & Power Co., Corinth, N. Y., has been authorized by the state Public Service Commission to put into effect new rate schedules which will result in savings of approximately $2,500 per annum to its customers. Under the revised tariff the first 10 kilowatt-hours will be reduced from 9.1 to 8.5 cents per kilowatt-hour. The next block of 30 kw.-hr. will be 5.5 cents per kilowatt-hour instead of 5.7. In the block between 40 and 280 kw.-hr. the price will be 2.7 cents per kilowatt-hour against the existing rate of 3 cents. All consumption over 280 kw.-hr. will be at the rate of 2.5 cents per kilowatt-hour. The revision is on the basis of net charges and was proposed by the company to induce prompt payment of bills. Gross charges will remain unchanged. The new schedule became effective on May 20.

Chatham, Ontario, electric rates have been reduced $15,000 annually, Roy H. Reynolds, secretary-manager of the Chatham Public Utilities Commission, has announced. Cuts have been made in the domestic, commercial and power rate. It is estimated that approximately $7,000 will be saved by domestic consumers through a reduction in consumption charge from three cents to 2.8 cents for the first 60 kw.-hr. per month. The rate for additional consumption will be 0.08 cents per kilowatt-hour, the former rate being 0.09 cents. The reduction will mean a saving of approximately $2,500 to commercial users.

Ohio Public Service Co. has been authorized by the state Public Utilities Commission to abolish the one dollar monthly service charge now levied. This will represent a savings of approximately $150,000 a year to rural power consumers in the area.

•

U. G. I. Plan Approved

United Gas Improvement Co.'s stockholders at the recent annual meeting approved a plan to reclassify the company's capital stock by reducing the number of authorized shares from 35,000,000 with no par value to 3,500,000 with a $13.50 par value. Holders of 15,239,666 of the outstanding 23,252,000 shares voted for the change.

Below — Sherman 2-Hole Soldering Lug, made in standard and heavy duty types.

Below — Sherman seamless closed round end Soldering Lug.

Above — Sherman Heavy Duty 4-Hole Soldering Lug

100% Conductivity

Since the primary function of a Soldering Lug is to carry current, here at Sherman we try to build into every lug the maximum current-carrying capacity.

For one thing, all Sherman Soldering Lugs, regardless of whether they are wrought from copper strip or stamped from tubing, are made of *pure* copper — rated at *100% conductivity*.

Then, too, we do a lot of other things to insure highest conductivity. We take a lot of pains to have all lugs bright and clean, for perfect soldering. We make sure there are no burrs or sharp edges. On heavy duty lugs we make the barrels extra long, to provide plenty of contact. And on *all* lugs, we insist that contact surfaces be FLAT!

If you are not already using Sherman lugs, why not give them a trial, and see for yourself the value of these additional Sherman features?

H. B. SHERMAN MFG. CO.

BATTLE CREEK, MICHIGAN

•

Sherman

SOLDERING LUGS

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Utility and Industrial Valuations, Design and Construction of Power Systems, Water Supplies, Sewerage and Sewage Disposal, Factory Production and Cost Control Systems.

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General Hydraulic Engineering, including the design, financing, construction and management of hydro-electric power plants.

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REA Announces New Allotments

Announcement has recently been made of Rural Electrification Administration allotments to 26 co-ops in 13 states. The funds which total $1,545,000, to be used chiefly for the extension of electric service to farms qualifying under War Production Board regulations permitting connections for the purpose of increasing food production, bring total REA allotments to $489,322,051, of which $23,359,138 represents operations during the current fiscal year. No construction will be undertaken which does not have WPB approval.

Included are the following allotments:

ARKANSAS—Arkansas Valley Electric Co-operative Corp., Ozark, $50,000; Ozarks Rural Electric Co-operative Corp., Fayetteville, $105,000.

COLORADO—San Luis Valley Rural Electric Co-operative, Inc., Monte Vista, $200,000.

KENTUCKY—Hickman - Fulton Counties Rural Electric Co-op. Corp., Hickman, $75,000.

LOUISIANA—Washington - St. Tammany Electric Membership Corp., Franklinton, $100,000.

MARYLAND—Choptank Electric Co-operative, Inc., Denton, $20,000.

MINNESOTA—Stearns Co-operative Electric Association, Melrose, $100,000; Traverse Electric Co-op., Inc., Wheaton, $80,000; Freeborn-Mower Co-op. Light & Power Assn., Albert Lea, $75,000.

MISSOURI—Platte - Clay Electric Co-op., Inc., Platte City, $20,000; Nodaway-Worth Electric Co-op., Inc., Maryville, $25,000.

NORTH CAROLINA—Edgecombe - Martin County Electric Membership Corp., Tarboro, $25,000.

OKLAHOMA—Cimarron Electric Co-op., Kingfisher, $185,000.

PENNSYLVANIA—Somerset Rural Electric Co-op., Inc., Somerset, $20,000; Jefferson Electric Co-op., Inc., Brookville, $15,000.

TEXAS—Medina Electric Co-op., Inc., Hondo, $70,000; Floyd County Rural Electric Co-op., Inc., Floydada, $50,000; Tri-County Electric Co-op., Azle, $50,000; Lamb County Electric Co-operative, Inc., Littlefield, $50,000; Shelby County Refrigeration Co-operative, Inc., Center, $28,000; Trenton Refrigeration Co-operative, Inc., Trenton, $24,000.

VIRGINIA—Virginia Electric Co-operative, Bowling Green, $60,000; Southside Electric Co-operative, Crewe, $50,000; Mecklenburg Electric Co-operative, Chase City, $50,000; Northern Piedmont Electric Co-op., Culpeper, $15,000.

WASHINGTON—Quinault Light Company, Quinault, $3,000.

•

Utility Coal Consumption

Electric utility power plants consumed 6,820,334 tons of coal in March, 1944, the Federal Power Commission reports. The report stated that the coal stocks of electric utility power plants as of April 1, 1944 were 0.2 percent more than stocks of the same date last year.

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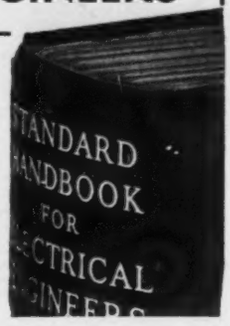

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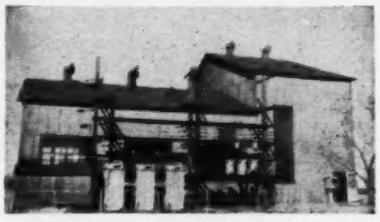

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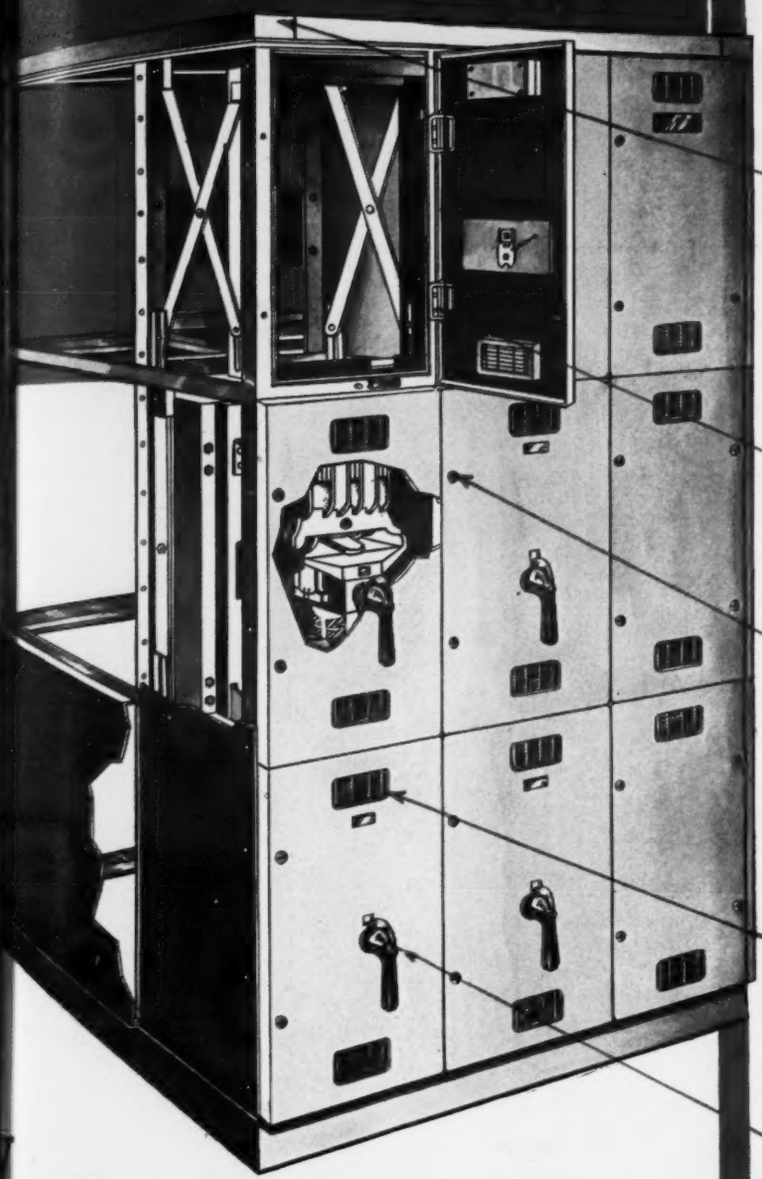
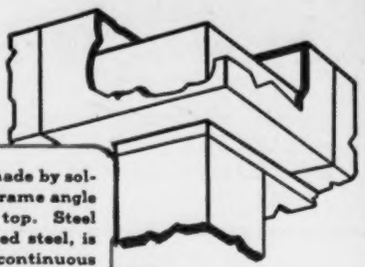
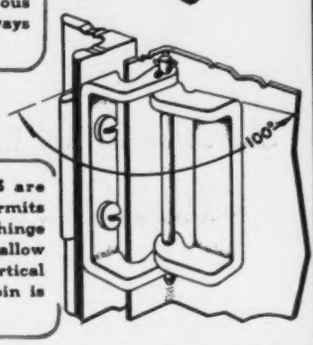
ETAILS TOO – YOUR NEEDS GUIDE DESIGN OF I-T-E DRAWOUT SWITCHGEAR

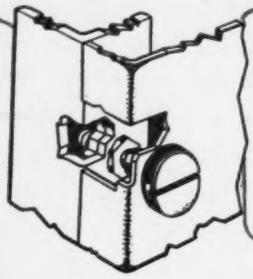


CORNERS are made by solidly welding frame angle to sheet-steel top. Steel trim, of formed steel, is added as a continuous finishing member always in alignment.



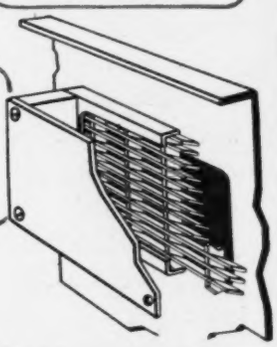


CONCEALED HINGES are sturdy. Design permits 100° swing. Slots in hinge and frame-angle allow horizontal and vertical alignment. Hingepin is readily removable.



PANEL SCREW has large head chamfered to prevent marring of finish. Palnut keeps screw attached to door at all times. Floating nut-block permits adjustment so that screw can be perfectly aligned with fastening thread.

LOUVERS are grille type, giving adequate air flow. Mounting is flush. Baffling is used when ventilating opening is close to arc chutes.



OPERATING HANDLE, mounted on front of door, disengages automatically when door is opened. Only 90° turn is required to close or trip the circuit breaker. Handle may be padlocked in open position.

ou buy switchgear for long-term service. You want everying to be strong and dependable throughout. When a door opened, you want it to swing far enough to give full access. have ventilation, you want something more than a few holes umped" into a sheet of metal; you want louvers designed th plenty of engineering thought. With I-T-E switchgear u get careful design down to the last detail.

plan switchgear, have a description of I-T-E design deils at hand. Let an I-T-E engineer go over them with you. ave them written into your specifications. Descriptions are vailable in Bulletin 4207.

Representatives in Principal Cities

I-T-E

AIR SWITCHGEAR

IMMERSED IN AIR — ENCASED IN STEEL

ARMY E NAVY

I-T-E

CIRCUIT BREAKER CO

What do you want to know about Turbine Oil?

Recently a number of utility plant men were asked, "What do you want to know about turbine oil?" Several of them had very specific questions. They are answered here because they may help you in selecting a turbine oil that solves, once and for all, the ever present problem of turbine oil maintenance. One question is taken up each month, but you can get the answers to all of them now—see the booklet offer.

3. What is an oxidation inhibitor—how does it prevent acidity?

It is easier to prove that an oxidation inhibitor does prevent acidity formation in a turbine oil than it is to tell exactly how and why it works. Short of being able to look into a turbine oil, and to see molecules and to study their reactions—how an oxidation inhibitor operates must be a molecular theory.

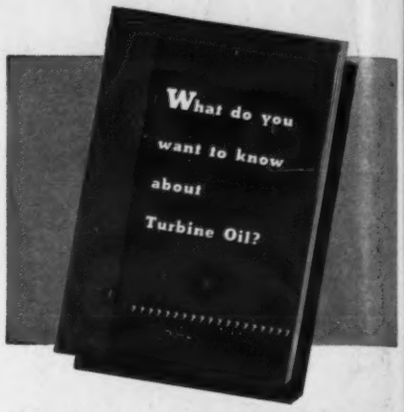
It is known that petroleum molecules have an affinity for oxygen. When the molecules of conventional turbine oil unite with oxygen, the products of oxidation include two types—asphaltenes and oil soluble acids. This we know from cold, chemical analysis.

The molecules that form asphaltenes can be removed by refining. But when they are, the acid-formers become more active. They oxidize to form acids by what is called an "autocatalytic" or "chain" reaction. At first only a very few molecules of the oil are affected. These promote the oxidation of other molecules, and so on until the oil is oxidizing rapidly. The function of an inhibitor is to break the "chain" in its earliest stages.

To go from theory to known fact—that the inhibitor in Nonpareil effectively stops acidity formation—the records of many thousands of gallons of oil in hundreds of turbines may be had as proof. These records show that acidity does not increase above 0.15 mg.KOH/gm. and usually remains nearer 0.05 even after ten to fifteen years' service. Of course, that means without special treating or sweetening of the oil to reduce acidity.

Standard Oil gives a *written* guarantee of this performance of Nonpareil for the life of a turbine. What this guarantee means to users of Nonpareil is told in this space next month.

Gasoline Powers the Attack . . .
Don't Waste a Drop!



For all the answers send for this booklet...it contains answers to questions such as these:

1. What causes turbine oil deposits or sludge?
2. What causes acidity increase in turbine oil?
3. What is an oxidation inhibitor—how does it prevent acidity?
4. How does a guaranteed turbine oil protect the user?
5. Does the inhibitor in Nonpareil Turbine Oil wear out?
6. What causes corrosion in turbines?

Send for a copy of this booklet, or better still, ask for a Standard Lubrication Engineer. He can answer your specific questions about Nonpareil Turbine Oil. Write Standard Oil Company (Indiana), Room 1223, 910 S. Michigan Ave., Chicago 80, Ill., for a copy of the booklet, or the Engineer nearest you.

NONPAREIL TURBINE OIL

STANDARD OIL COMPANY (INDIANA)

STANDARD SERVICE